SOUTHALL'S MATERIA MEDICA.

BARCLAY.

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SOUTHALL'S

ORGANIC MATERIA MEDICA.

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ORGANIC MATERIA MEDICA,

BEING

A HANDBOOK TREATING OF SOME OF THE MORE IMPORTANT OF THE
ANIMAL AND VEGETABLE DRUGS MADE USE OF IN MEDICINE,
INCLUDING THE WHOLE OF THOSE CONTAINED
IN THE BRITISH PHARMACOPŒIA;

DESIGNED FOR THE USE OF

TEACHERS, PHARMACEUTICAL AND MEDICAL STUDENTS,

CHEMISTS, DRUGGISTS AND OTHERS.

FIFTH AND ENLARGED EDITION.

BY

JOHN BARCLAY, B.Sc. (Lond.)

SOMETIME LECTURER ON MATERIA MEDICA AND PHARMACY IN MASON
COLLEGE, BIRMINGHAM.

LONDON:
J. & A. CHURCHILL,
7, GREAT MARLBOROUGH STREET, W.
1896.

18998

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BIRMINGHAM.

PREFACE TO FIFTH AND ENLARGED EDITION.

THE First Edition of "Southall's Materia Medica" was prepared in 1874 by the late William Southall, F.L.S., and thirteen years later, in 1887, a fourth and enlarged edition was published. This latter has for some time been out of print, and the occasion of the preparation of a new edition was regarded as a favourable one for making some very considerable amplifications and alterations.

The once almost universal system of classification, according to botanical origin, has been abandoned, that of placing together drugs of analogous form and physical character having been adopted in its stead. This method of classification may now be said to have received official sanction in this country, inasmuch as it is made use of in the Calendar of the Pharmaceutical Society. In order, however, to facilitate the comparison of drugs of allied botanical origin, a list of the more important medicine-yielding plants classified under Natural Orders is given at the commencement of the book.

The number of drugs treated has been considerably extended, notably in the direction of those of Transatlantic origin, this course having seemed advisable on account of the increasing favour with which those remedies have been received in this country during the last few years.

The chemical notes have been somewhat amplified, and an attempt has been made to bring them up to date; while the use of small type in the form of notes dealing with matters of minor importance, such as substitutions, adulterations, allied drugs, etc., has been adopted, it being intended that the student may thus, to some extent, be guided as to the relative value of the different items of information supplied.

The introduction of a few words concerning the uses to which each drug is applied is a feature new to this edition; but there is here no intention of teaching the student either Pharmacology or Therapeutics the aim being merely to give him just such information as a person engaged in the handling of drugs might with advantage possess.

In treating of those substances which are included in the British Pharmacopœia, the official preparations of these are enumerated, mention also being made of their strength, and in the case of tinctures, etc., of the menstrua used in preparing them, whilst such non-official preparations as are considered sufficiently noteworthy are also referred to in the articles on foreign official drugs, reference is usually made to the Pharmacopœias in which they are included, the more important preparations of these and of non-official drugs also, at the same time receiving mention.

An attempt has been made to give, as an introduction to each group of drugs, an outline of the physical and chemical characters common to that group, it being thought that the student will thereby be aided in his study of the individual members. To further assist him in the correct understanding of the technical terms of description made use of, a glossary of these has been compiled and added at the end of the book. Matter relating to the British Official Materia Medica is printed in large type, in order to make a distinction between these and the less important substances which may or may not be official in other countries.

The author of the present edition wishes it to be clearly understood that the work in no sense pretends to be anything other than a compilation, and to the student whose means of access to larger works of reference are limited, a book of this kind, compiled as it is from many and various sources, should be of considerable value. Some of the information made use of, particularly that dealing with recent work, has been gleaned from original papers, but the bulk of the matter is derived from the admirable text-books and other works mentioned below. Instead of scattering references to sources of information made use of throughout the text, a course which would have involved considerable difficulty, and which for a work of this kind seemed inadvisable, it has seemed better to acknowledge in this place the sources to which the editor of the book is chiefly indebted.

In the case of those substances included in the British, United States, and Indian Pharmacopœias, the official descriptions found therein are quoted almost *verbatim ;* while for information concerning the characters of many of the others, the author is indebted to those most admirable compilations, the National and United States Dispensatories. The same two works have also furnished material for many of the chemical notes provided, and it is not too much to say that but for their existence a considerable portion of this work could never have appeared.

Similarly, the *Pharmacographia* (Flückiger and Hanbury) and the Text Books of Pereira (*Elements of Materia Medica and Therapeutics*) and Maisch (*Manual of Organic Materia Medica*) have been of great assistance. The editor is also indebted for much valuable information to *Squire's Companion to the British Pharmacopœia* (Sixteenth Edition), and *Martindale and Westcott's Extra Pharmacopœia* (Eighth Edition). For the purely chemical part of the work much help has been derived from the following :—*Attfield's Chemistry, Richter's Organic Chemistry, Thorpe's Dictionary of Applied Chemistry*, and *Allen's Commercial Organic Analysis*, while the papers of J. C. Umney (*Essential Oils in their Relation to the British Pharmacopœia and Trade*), and the Pamphlet of Helbing and Passmore dealing with the same subject have been of great service in supplying information for writing the article on Volatile Oils.

The student who is desirous of making a more detailed study of the subject cannot do better than turn to the above-mentioned works and papers.

Of the many imperfections of the work the author is sufficiently aware; but the favour with which the preceding editions of the book have been received, as well as the numerous enquiries made for it during the time in which it has been out of print, give fair warranty for the belief that it has hitherto met a demand which should not be permitted to go unsupplied.

BIRMINGHAM,
March, 1896.

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ABBREVIATIONS.

N.O.	..	Natural Order.
Syn.	..	Synonym.
B.P.	..	British Pharmacopœia.
U.S.	..	United States.
U.S.P.	..	United States Pharmacopœia.
P.G.	..	Pharmacopœia Germanica.
P.L.	..	Pharmacopœia Londinensis.
P.I.	..	Pharmacopœia Indica.
B.P.C.	..	British Pharmaceutical Conference.
B.P.C.F.	..	British Pharmaceutical Conference Formulary.
N.F.	..	National Formulary.
S.G.	..	Specific Gravity.
F.	..	Fahrenheit.
C.	..	Centigrade.
M.P.	..	Melting Point.
Hab.	..	Habitat.

CLASSIFICATION OF

BOTANICAL MATERIA MEDICA

ACCORDING TO

NATURAL ORDERS.

(SYSTEM OF BENTHAM AND HOOKER.)

British Flora are marked with an asterisk (*); those contained in the British Pharmacopœia are underlined.

Sub-Kingdom I.—PHANEROGAMIA.

Class I.—ANGIOSPERMÆ.

Sub-Class I.—DICOTYLEDONES.

Division I.—POLYPETALÆ.

Sub-Division I.—THALAMIFLORÆ.

Natural Order—RANUNCULACEÆ.

Delphinium Stapisagria.
Nigella sativa.
,, damascena.
*Aconitum Napellus.
,, heterophyllum.
,, ferox.
,, Fischeri.
Cimicifuga racemosa.
Helleborus niger.
Hydrastis canadensis.
Coptis Teeta.
*Anemone Pulsatilla.
,, hepatica.

MAGNOLIACEÆ.

Magnolia, *spec. var.*
Illicium anisatum.
Drymis Winteri.

MENISPERMACEÆ.

Menispermum canadense.
Jateorrhiza Calumba.
Tinospora cordifolia.
Chondrodendron tomentosum.
Anamirta paniculata.

BERBERIDEÆ.
- *Berberis vulgaris.
- Caulophyllum thalictroides.
- Podophyllum peltatum.

PAPAVERACEÆ.
- *Papaver somniferum.
- *Papaver Rhœas.
- Sanguinaria canadensis.
- *Chelidonium majus.

CRUCIFERÆ.
- *Brassica (Sinapis) alba.
- *Brassica (Sinapis) nigra.
- Brassica juncea.
- * ,, campestris.
- *Cochlearia Armoracia.

CISTINEÆ (CISTACEÆ).
- Helianthemum canadense.
- ,, corymbosum.
- Cistus, *spec. var.*

VIOLACEÆ (VIOLARIEÆ).
- *Viola tricolor.

CANELLACEÆ.
- Canella alba.
- Cinnamondendron corticosum.

BIXINEÆ (BIXACEÆ).
- Bixa Orellana.
- Gynocardia odorata.

POLYGALEÆ (POLYGALACEÆ).
- Polygala Senega.
- Krameria triandra.
- Krameria Ixina.

CARYOPHYLLEÆ (CARYOPHYLLACEÆ).
- Saponaria officinalis.

HYPERICINEÆ.
- *Hypericum perforatum.

GUTTIFERÆ.
- Garcinia Hanburii.

TERNSTRŒMIACEÆ (CAMELLIACEÆ).
- Camellia Thea.

DIPTEROCARPACEÆ.
- Dipterocarpus turbinatus.

MALVACCÆ.
- *Althæa officinalis.
- Hibiscus abelmoschus.
- ,, esculentus.
- Gossypium barbadense.
- ,, herbaceum.

STERCULIACEÆ.
- Sterculia (Cola) acuminata
- Theobroma Cacao.

Sub-Division II.—**DISCIFLORÆ.**

Natural Order—LINACEÆ (LINEÆ).
- *Linum usitatissimum.
- *Linum catharticum.
- Erythroxylon Coca.

- Zygophylleæ.
  - Guaiacum sanctum.
  - Guaiacum officinale.
- Geraniaceæ.
  - Geranium maculatum.
- Rutaceæ.
  - Citrus vulgaris.
  - Citrus Bergamia.
  - Citrus limonum.
  - Ruta graveolens.
  - Galipea Cusparia.
  - Ægle Marmelos.
  - Xanthoxylum fraxineum.
  - Toddalea aculeata.
  - Barosma betulina.
  - Barosma crenulata.
  - Barosma serratifolia.
  - Pilocarpus pennatifolius.
  - Pilocarpus, *spec. var.*
- Simarubeæ (Simarubaceæ).
  - Picræna (Quassia) excelsa.
  - Simaruba amara.
- Burseraceæ.
  - Balsamodendron Myrrha.
  - Balsamodendron Mukul.
  - ,, Africanum.
  - Boswellia Carterii.
  - Canarium commune.
- Meliaceæ (Cedrelaceæ).
  - Soymida febrifuga.
  - Azadirachta indica.
- Ilicineæ (Aquifoliaceæ).
  - Ilex Paraguayensis.
  - Prinos verticillatus.
- Celastrineæ.
  - Euonymus atropurpureus.
- Rhamnaceæ (Rhamneæ).
  - Rhamnus Purshianus.
  - *Rhamnus catharticus.
  - *Rhamnus Frangula.
  - Ceanothus Americanus.
- Ampelideæ.
  - Vitis vinifera.
- Sapindaceæ.
  - Paullinia Sorbilis.
  - Æsculus hippocastanum
- Anacardiaceæ.
  - Anacardium occidentale.
  - Pistacia lentiscus.
  - Pistacia Terebinthus.
  - Rhus radicans.
  - Rhus glabra.
  - Rhus toxicodendron.

Sub-Division III.—**CALYCIFLORÆ.**

- *Natural Order*—LEGUMINOSÆ.
  - Dipteryx odorata.
  - Physostigma venenosum.
  - ,, cylindrospermum.
  - Trigonella fœnum græcum.
  - Abrus precatorius.
  - Arachis hypogœa.
  - Cæsalpinia Bonducella.
  - Glycyrrhiza glabra.
  - Baptisia tinctoria.
  - Hæmatoxylon campechianum.
  - Pterocarpus Santalinus.
  - Cassia fistula.
  - Cassia acutifolia.
  - Cassia angustifolia.
  - *Cytisus Scoparius.
  - *Melilotus officinalis.
  - Tamarindus indica.
  - Erythrophlœum Guineense.
  - Piscidia Erythrina.
  - Mucuna pruriens.
  - Andira Araroba.
  - Pterocarpus Marsupium.
  - Acacia Catechu.
  - Acacia Senegal.
  - Astragalus gummifer.
  - Copaifera Langsdorffii.
  - Myroxylon toluifera.
  - Myroxylon Pereiræ.
- ROSACEÆ.
  - Prunus Amygdalus.
  - Prunus Laurocerasus.
  - *Prunus domestica.
  - Prunus Serotina.
  - Rosa centifolia.
  - Rosa gallica.
  - *Rosa canina.
  - Rosa damascena.
  - Cydonia vulgaris.
  - *Potentilla Tormentilla.
  - *Geum urbanum.
  - Hagenia Abyssinica.
  - *Rubus Idæus.
  - Rubus, *spec. var.*
  - Quillaia Saponaria.
- SAXIFRAGACEÆ (SAXIFRAGEÆ).
  - Heuchera americana.
  - Hydrangea arborescens.
- HAMAMELIDEÆ (HAMAMELACEÆ).
  - Hamamelis Virginica.
  - Liquidambar orientalis.

- Combretaceæ.
  - Terminalia, *spec. var.*
- Myrtaceæ.
  - Eucalyptus rostrata.
  - Eucalyptus globulus.
  - Eucalyptus resinifera.
  - Eucalyptus amygdalina.
  - Eucalyptus, *spec. var.*
  - Myrica acris.
  - Myrtus Chekan.
  - Eugenia caryophyllata.
  - Pimenta officinalis.
  - Melaleuca minor.
- Granateæ (Lythrarieæ).
  - Punica Granatum.
- Onagrarieæ (Oragraraceæ).
  - *Epilobium angustifolium.
- Turneraceæ.
  - Turnera microphylla.
- Cucurbitacæ.
  - Cucurbita Pepo.
  - *Bryonia alba.
  - *Bryonia dioica.
  - Citrullus Colocynthis.
  - Luffa Egyptiaca.
  - Ecballium Elaterium.
- Umbelliferæ.
  - Ferula Sumbul.
  - Ferula galbaniflua.
  - Ferula rubricaulis.
  - Ferula Narthex.
  - Ferula Scorodosma.
  - *Angelica officinalis.
  - *Petroselinum sativum.
  - *Peucedanum Ostruthium.
  - *Conium maculatum.
  - Hydrocotyle Asiatica.
  - *Apium graveolens.
  - *Carum Carui.
  - Carum Ajowan.
  - *Coriandrum sativum.
  - Cuminum Cyminum.
  - Pimpinella Anisum.
  - *Fœniculum capillaceum.
  - Anethum graveolens.
  - *Œnanthe Phellandrium.
  - *Daucus Carota.
  - Dorema Ammoniacum.
  - Opoponax Chironium.
- Cornaceæ.
  - Cornus florida.

Division II.—**GAMOPETALÆ.**

Sub-Division I.—**INFERÆ.**

Natural Order—CAPRIFOLIACEÆ.

- *Sambucus nigra.
- Viburnum prunifolium.
- *Viburnum Opulus.

RUBIACEÆ.

- Coffea Arabica.
- Cephaëlis Ipecacuanha.
- *Rubia tinctorum.
- Chiococca racemosa
- *Galium Aparine.
- Randia Dumetorum.
- Cinchona succirubra.
- Cinchona, *spec. var.*
- Remijia, *spec. var.*
- Uncaria Gambier.

VALERIANACEÆ (VALERIANEÆ).

- *Valeriana officinalis.

COMPOSITÆ.

- *Tussilago Farfara.
- Grindelia robusta.
- Grindelia squarrosa.
- *Taraxacum officinale.
- *Cichorum Intybus.
- *Inula Helenium.
- Anacyclus Pyrethrum.
- *Lappa officinalis.
- *Artemisia vulgaris.
- *Artemisia Absinthium.
- *Artemisia maritima.
- Arnica montana.
- *Calendula officinalis.
- *Matricaria Chamomilla.
- *Anthemis nobilis.
- *Anthemis Cotula.
- Pyrethrum cinerariæfolium.
- Carthamus tinctorius.
- Eupatorium perfoliatum.
- *Erigeron canadense.
- *Achillea Millefolium.
- *Tanacetum vulgare.
- Cnicus benedictus.
- *Lactuca virosa.
- *Silybum Marianum.

CAMPANULACÆ.

- Lobelia inflata.

Sub-Division II.—**HETEROMERÆ.**

Natural Order.—ERICACEÆ.

- *Arctostaphylos Uva-ursi.
- Chimaphilla umbellata.
- Gaultheria procumbens.
- *Ledum palustre.

PLUMBAGINEÆ.

- *Statice Limonium.

SAPOTACEÆ.
- Dichopsis gutta.
- Chrysophyllum glycyphlœum.

EBENACEÆ.
- Diospyros embryopteris.

STYRACEÆ.
- Styrax Benzoin.

Sub-Division III.—**BICARPELLATÆ.**

Natural Order.—OLEACEÆ.
- Olea Europœa.
- Fraxinus Ornus.

APOCYNACEÆ.
- Apocynum Cannabinum.
- Nerium Oleander.
- Alstonia constricta.
- Alstonia scholaris.
- Aspidosperma Quebracho.
- Strophanthus hispidus.
- *Vinca major.
- *Vinca minor.

ASCLEPIADEÆ (ASCLEPIADACEÆ).
- Hemidesmus Indicus.
- Asclepias tuberosa.
- Tylophora asthmatica.
- Gonolobus Condurango.
- Calotropis gigantea.

LOGANIACEÆ.
- Strychnos Nux Vomica.
- Strychnos Ignatii.
- Strychnos Castelnœana.
- Gelsemium nitidum.
- Spigelia Marilandica.

GENTIANACEÆ (GENTIANEÆ).
- Gentiana lutea.
- Frasera Walteri.
- *Menyanthes trifoliata.
- Ophelia Chirata.
- *Erythræa Centaurium.

HYDROPHYLLACEÆ.
- Eriodictyon glutinosum.

BORAGINEÆ (BORAGINACEÆ).
- Anchusa tinctoria.
- *Symphytum officinale.

CONVOLVULACEÆ.
- Convolvulus Scammonia.
- Ipomœa purga.

SOLANACEÆ.
- *Datura Stramonium.
- *Hyoscyamus niger.
- *Atropa Belladonna.
- Nicotiana Tabacum.
- Duboisia myoporoides.
- *Solanum Dulcamara.
- Capsicum annuum.

SCROPHULARINEÆ (SCROPHULARIACEÆ).
*Digitalis purpurea.
Leptandra Virginica.
PEDALINEÆ.
Sesamum indicum.
LABIATEÆ.
Collinsonia canadensis.
Rosmarinus officinalis.
Thymus vulgaris.
Salvia officinalis.
Lavandula vera.
*Marrubium vulgare.
*Mentha Piperita.
*Mentha viridis.
*Mentha Pulegium.
*Mentha arvensis.
Hyossopus officinalis.
*Origanum vulgare.
*Melissa officinalis.
Hedeoma pulegioides.
Monarda punctata.
Scutellaria laterifolia.
Pogostemon Patchouli.

Division III.—**MONOCHLAMYDEÆ. (INCOMPLETÆ.)**

CHENOPODIACEÆ.
*Chenopodium ambrosioides.
PHYTOLACCACEÆ.
Phytolacca decandra.
POLYGONACEÆ.
Rheum, *spec. var.*
*Polygonum Bistorta.
*Rumex acetosa.
*Rumex crispus.
ARISTOLOCHIACEÆ.
Aristolochia Serpentaria.
,, reticulata.
Asarum canadense.
PIPERACEÆ.
Piper Methysticum.
Piper angustifolium.
Piper Cubeba.
Piper nigrum.
Piper officinarum.
Chavica Roxburghii.
MYRISTICACEÆ (MYRISTICEÆ).
Myristica fragrans.
MONIMACEÆ.
Peumus Boldo.
LAURINEÆ (LAURACEÆ).
Sassafras officinale.
Laurus nobilis.
Nectandra Rodiæi.
Cinnamomum Cassia.
,, Camphora.
,, zeylanicum.
Coto.

- THYMELACEÆ (THYMELEACEÆ).
  - *Daphne Mezereum.
  - * ,, Laureola.
- SANTALACEÆ.
  - Santalum album.
- EUPHORBIACEÆ.
  - Croton Tiglium.
  - Ricinus communis.
  - Curcas purgans.
  - Euphorbia Ipecacuanha.
  - Stillingia sylvatica.
  - Euphorbia pilulifera.
  - ,, resinifera.
  - Croton Eleuteria.
  - Mallotus phillipinensis.
  - Hevea, *spec. var.*
  - Manihot utilissima.
  - ,, Apii.
- URTICACEÆ (ULMACEÆ, MOREÆ).
  - Cannabis sativa.
  - *Humulus Lupulus.
  - Morus nigra.
  - Ulmus fulva.
  - * ,, campestris.
  - Ficus Carica.
- JUGLANDEÆ (JUGLANDACEÆ).
  - Juglans cinerea.
  - ,, regia.
- MYRICACEÆ.
  - Myrica cerifera.
- CUPULIFERÆ.
  - Castanea dentata.
  - *Quercus robur.
  - ,, lusitanica.
- SALICINEÆ.
  - *Salix, *spec. var.*
  - *Populus, *spec. var.*

Sub-Class II.—MONOCOTYLEDONES.

Division I.—MICROSPERMÆ.

- ORCHIDEAÆ (ORCHIDACEÆ.)
  - Orchis, *spec. var.*
  - Cypripedium, *spec. var.*
  - Vanilla planifolia.

Division II.—EPIGYNÆ.

- ZINGIBERACEÆ (SCITAMINEÆ).
  - Amomum Melegueta.
  - ,, Granum Paradisi.
  - Zingiber officinale.
  - Curcuma longa.
  - Alpinia officinarum.
  - ,, Galanga.
  - Elettaria Cardamomum.
- HÆMADORACEÆ.
  - Aletris farinosa.
- IRIDEÆ.
  - Iris Florentina.
  - ,, versicolor.
  - *Crocus sativus.

Division III.—CORONARIÆ.

- LILIACEÆ (SMILACEÆ).
  - Colchicum autumnale.
  - Schænocaulon officinale.
  - Smilax officinalis.
  - Urginea Scilla.
  - Veratrum viride.
  - Veratrum album.
  - Allium sativum.
  - *Convallaria majalis.
  - Aloe Perryi.
  - Aloe vulgaris.
  - Aloe spicata.
  - Smilax China.

Division IV.—CALICYNEÆ.

- JUNCACEÆ.
  - Xanthorrhœa hastilis.
  - ,, arborea.
- PALMACEÆ (PALMEÆ).
  - Areca Catechu.
  - Calamus draco.
  - Elais guineensis.
  - Cocos nucifera.
  - Metroxylon Sagu.
  - Arenga saccharifera.

Division V.—NIDIFLORÆ.

- AROIDEÆ.
  - *Arum maculatum.
  - *Acorus Calamus.

Division VI.—APOCARPEÆ.

Division VII.—GLUMACEÆ.

- GRAMINEÆ.
  - *Triticum repens.
  - Zea Mays.
  - Hordeum distichon.
  - *Phalaris canariensis.
  - Andropogon Nardus.
  - ,, citratum.
  - Triticum sativum.
  - Oryza sativa.

Class II.—GYMNOSPERMÆ.

- CONIFERÆ.
  - Juniperus Sabina.
  - Thuja occidentalis.
  - *Juniperus communis.
  - ,, Oxycedrus.
  - Pinus Larix.
  - ,, picea.
  - ,, australis.
  - ,, tæda.
  - ,, balsamea.
  - * ,, sylvestris.
  - ,, Pinaster.
  - ,, *spec. var.*
  - ,, Dammara.
  - Callitris quadrivalvis.
  - Dammara australis.

Sub-Kingdom II.—CRYPTOGAMIA.

Class I.—THALLOPHYTA.

Sub-Class I.—ALGÆ.

Division I.—PHÆOPHYCEÆ.

Sub-Division I.—**PHÆOSPOREÆ.**

Laminaria digitata.

Sub-Division II.—**FUCACEÆ.**

Fucus vesiculosus.

Division II.—RHODOPHYCEÆ. (FLORIDEÆ.)

Chondrus crispus.
,, mammilosus.
Gracillara lichenoides.
,, confervoides.

Sub-Class II.—FUNGI.

Division I.—USTILAGINEÆ.

Ustilago Maydis.

Division II.—ASCOMYCETES.

Sub-Division I.—**SACCHAROMYCETES.**

Saccharomyces Cerevisiæ.

Sub-Division II.—**PYRENOMYCTES.**

Claviceps purpurea.

Sub-Division III.—**LICHENES.**

Cetraria islandica.

Lecanora, *spec. var.*
Rocella, *spec. var.*

Division III.—BASIDEOMYCETES.

Sub-Division I.—**HYMENOMYCETES.**

Boletus Laricis.

Class II.—VASCULAR CRYPTOGAMS.

Sub-Class I.—FILICINEÆ. (FILICES.)

Aspidum Filix mas.

Adiantum capillis veneris.

Sub-Class II.—LYCOPODINEÆ.

Division—LYCOPODIACEÆ.

Lycopodium clavatum.

SECTION I.

ORGANISED DRUGS OF VEGETABLE ORIGIN

Under this head are included all vegetable drugs having definite organised structure, and consisting of some form of cellular vegetable tissue.

A. PHANEROGAMOUS.

These consist of organised vegetable drugs derived from, or themselves being, flowering plants.

1. SEEDS.—SEMINA.

General Morphology of the Seed.—The seed is the fertilised ovule, and contains the *embryo* or initial plantlet with its accompanying food material or *albumen*. When the seed has a stalk it is known as the *podosperm*, and it corresponds to the funiculus of the ovule; the point of attachment in the fruit whether the seed be stalked or sessile being known as the *hilum*. The foramen through which the descending radicle of the embryo passes during germination is known as the *micropyle*, and the proper base of the seed from which, during development, the coats of the ovule originate is known as the *chalaza*. When the micropyle and the hilum (with the chalaza) are situated at the opposite ends of an imaginary straight line, drawn from the base of the seed to its apex, the seed is said to be *orthotropous;* when the ovule, in the course of growth, has curved on itself in such a way as to bring the apex of the seed near the base, but having the micropyle and hilum (with chalaza) still at opposite ends, the seed is said to be *campylotropous, e.g.*, seeds of many Cruciferæ, Chenopodiaceæ; but when, as is most commonly the case, the ovule, in course of growth, has become completely inverted on its base, being parallel with the apparent continuation of the funicle and so bringing the chalaza to the apex of the seed while leaving the hilum at its base, the seed is said to be *anatropous*. The apparent continuation of the funicle from the hilum to the chalaza is frequently marked by a corded thickening, and is known as the *rhaphe*. The seed-coats are normally two—an outer *testa* or *spermoderm* and an inner *tegmen* or *endopleura*. The testa not infrequently has appendages useful for dissemination purposes, *e.g.*, the wing of the Pine seed, the cotton of the seed of Gossypium, the awn of Strophanthus, etc.; again, it may be covered with short hairs, or its epidermal cell-walls may be gelatinous or mucilaginous (cress, flax), thus affording a useful power of cohesion. The rhaphe may be prominent and easily discernible (Nux Vomica), or it may be hidden. Certain seeds have appendages of more or less crest-like form, *e.g.*, the *caruncle* of the seed of Ricinus, while an accessory seed covering, more or less complete, is formed during the ripening of certain seeds which is known as the *aril*. The point from which the growth of the aril normally takes place is the hilum, but in the nutmeg it is formed round the micropylar end; it may be either fleshy (Podophyllum) or membranous (Cardomum). The albumen or food material may be present in the seed either surrounding the embryo in which case the seed is said to be *albuminous*, or the embryo may, in the course of its development, have absorbed the whole of the food material and so rendered the seed *exalbuminous*. The albumen may be *farinaceous* (*e.g.*, cereals); *oily* (*e.g.*, poppy); *fleshy* (*e.g.*, horse-chestnut); *corneous* (*e.g.*, coffee); *bony* (*e.g.*, vegetable ivory); or un-uniform (*e.g.*, nutmeg, where by the involution of the tegmen, it becomes *ruminated*). The embryo consists of three parts, viz., the *radicle* or caulicle, the *cotyledons*, or seed leaves, and the *plumule*, or primary shoot of the future plant. The disposition of the embryo with regard to the albumen is various, it being either straight or variously curved, while the cotyledons may be more or less separated, or folded on one another in many different ways.

General Chemical Characters of Seeds.—Since the seed is the reservoir of reserve food material for the young plant, it usually consists largely of nutritive substance, carbohydrate, proteids, or fats, &c. In the cereals and in many leguminous seeds, such as Physostigma, we meet with starch and proteid matter, the latter in the form of gluten in the cereals, of legumin in the Leguminosæ. Fat or fixed oil is also frequently met with, *e.g.*, seeds of castor, flax, nutmeg, etc. The seed commonly contains also some ferment by means of which, during germination, the food material is rendered soluble and capable of absorption by the young plant. Associated with these and similar inert substances are to be found those active principles to the presence of which the medicinal seeds owe their value; these are of the most various kinds, and must be regarded as excretory products, since they appear to have no useful place in the plant economy. The amount of mineral matter or ash present in seeds varies from 1 or 1½ per cent. (Nux Vomica) to as much as 8 or 9 per cent. (Stavesacre), and contains usually potash, soda, magnesia, lime, phosphorus, sulphur, silica, and iron in varying proportions, the phosphorus being commonly present in excess of the other elements.

STAPHISAGRIÆ SEMINA—Stavesacre Seeds.

—The dried ripe seeds of Delphinium Staphisagria.

N.O.—Ranunculaceæ.

Syn.—Semina Staphidis agriæ seu pedicularis.

Habitat.—South of Europe.

Characters.—Irregularly triangular or obscurely quadrangular, arched, blackish-brown when fresh, but becoming dull greyish-brown by keeping. Testa wrinkled and deeply pitted; nucleus soft, whitish, oily. No marked odour; taste nauseously bitter and acrid.

Chemistry.—The yellow nucleus contains about 30 per cent. of a fixed oil; three alkaloids are also present, viz.—*delphinine*, *delphisine* and *delphinoidine*. The two former are acrid and poisonous, resembling aconitine. The ointment consists of a 10 per cent. solution of the fixed oil in lard, the greater part of the alkaloids (resident mainly in the integument) being also dissolved.

Uses etc.—Chiefly in the form of ointment for the destruction of pediculi.

B.P. Preparation.—Unguentum Staphisagriæ.

DELPHINIUM CONSOLIDA.—Larkspur.

N.O.—Ranunculaceæ.

Syn.—Knightspur.

Habitat—Central Europe (and cultivated).

This plant is the source of Delphinium, U.S.P. (seeds)—and of flores, herbæ, and semen consolidæ,

Delphinium Ajacis, Delphinium exaltatum, Delphinium azureum are nearly allied to the above.

PAPAVERIS SEMINA—Poppy Seeds.

—The seeds of Papaver somniferum.

N.O.—Papaveraceæ..

Syn.—Maw seed.

Habitat.—W. Asia (and cultivated).

These seeds find occasional use in medicine; they contain about 50 per cent. of fixed oil, which is official in P.G.; are demulcent and non-narcotic.

SINAPIS ALBÆ SEMINA—White Mustard Seeds.

—The dried ripe seeds of Brassica alba (Sinapis alba).

Habitat.—Britain.

N.O.—Cruciferæ.

Characters. — About one-twelfth of an inch in diameter, roundish, pale yellow, very finely pitted, hard, yellow, and oily. Inodorous; taste pungent.

The seeds, which are really yellow, are contained in hispid spreading siliquas, which are characterised by being beaked.

Chemistry.—A fixed oil (20 to 25 per cent.), *myrosin*, *sinalbin*, and *sinapine sulphocyanide*. Sinalbin and the ferment myrosin, in the presence of water, yield *sulphocyanate of acrinyl* (C_7H_7O CNS), an acrid non-volatile body. There is no starch present in mustard. An infusion of the seeds causes a deep red colour with a solution of ferric chloride.

Uses etc.—Chiefly for powdering and mixing with black mustard seeds to form mustard (sinapis). The powder is used for preparing mustard poultice (cataplasma sinapis). It is not infrequently adulterated with farinaceous substances coloured by turmeric.

B.P. Preparation.—Sinapis *(for preparations of which see under Sinapis nigræ semina).*

SINAPIS NIGRÆ SEMINA—Black Mustard Seeds.

—The dried seeds of Brassica nigra (Sinapis nigra).

N.O.—Cruciferæ.

Habitat.—Britain.

Characters.—Scarcely half the size of white mustard seeds, or not more than about one-fifth of an inch in diameter, roundish, dark reddish or greyish brown, finely pitted, hard; internally yellow. Inodorous when dry, even when powdered, but when triturated with water exhaling a strong pungent odour so as to affect the eyes; taste, very pungent.

The seeds are contained in smooth adpressed siliquas, and are much smaller than those of the white variety. Their pungency is also more marked.

Chemistry.—Fixed oil (20 to 25 per cent.), *myrosin*, *sinigrin* (myronate of potassium). The pungent odour is due to the inter-action of the two last-named bodies, and consequent development, in the presence of cold water, of the volatile oil of mustard, known as *sulphocyanate of allyl* (C_3H_5CNS). Ferric chloride solution communicates to an infusion of black mustard seeds an orange tint.

Oleum Sinapis B.P., the volatile oil, is official, and is obtained from the seed, after the expression of the fixed oil, by distillation with water, subsequent to maceration for a short period to allow of fermentation being set up. Its S.G. is 1·015 and it is, therefore, heavier than water; it may be prepared synthetically.

Its production from the seed can be prevented by a heat above 48·8° C. or by the addition of alcohol, for these agents coagulate the nitrogenous fermentative principle myrosin, and thus render it inert ; hence in the preparation of mustard for the table or for poultices, cold or tepid water should always be used.

Uses, etc.—For the production of powdered mustard (*see Sinapis albæ semina*) and of the volatile oil.

B.P. Preparations.—Sinapis.*
Oleum Sinapis.†

* *Used in preparing* Charta Sinapis and Cataplasma Sinapis.
† *Contained in* Linimentum Sinapis compositum, 1 in 40.

SINAPIS (BRASSICA) JUNCEA.—Indian Mustard.

N.O.—Cruciferæ.

Syn.—Rae, Sarepta.

Habitat—India (cultivated in Russia).

The seeds of this plant yield Russian or Indian mustard. Their chemical properties are said to be identical with those of black mustard seed.

BRASSICA CAMPESTRIS.—Wild Rape.

N.O.—Cruciferæ.

Syn.—Field cabbage.

Habitat.—Various.

Certain cultivated varieties of this species yield the seeds from which *rape* and *colza oils* are obtained.

LINI SEMINA.—Linseed.—The dried ripe seeds of Linum usitatissimum.

N.O.—Linaceæ.

Syn.—Flax seed.

Habitat.—Britain and other countries.

Characters.—Small, usually varying in length from one-sixth to one-fourth of an inch, more or less flattened, ovoid, somewhat obliquely pointed ; brown, smooth, and shining on their outer surface, internally yellowish-white. Odourless, but with a mucilaginous oily taste. A decoction of linseed when cold is not made blue by solution of iodine.

Chemistry.—Besides the mucilage and fixed oil, nitrogenous compounds, small quantities of wax, resin, sugar, malates, acetates, and other salts are present. The ash amounts to about 3 per cent.

B.P. Preparations.

Farina Lini.
Infusum Lini - - - 15 grains to 1 fluid ounce.

Oleum Lini - - - -	yield, 20 to 30 per cent.
Cataplasma Lina - -	2 of meal to 5 of boiling water.

Note.—The variability of the size of flax seed is dependent upon the part of the world where it is grown. The mucilage (15 per cent.) results from a change of the starch during the ripening process, as is shown by the fact that starch is found only in the unripe seeds. The oil (20 to 30 per cent.) is obtained by expression with little—or better—no heat; it is a type of "drying oil," this property being due to the transformation of its linoleic acid, which exists in combination with glyceryl, into oxylinoleic acid. By boiling the oil with a little oxide of lead or manganese the drying property is greatly increased, and the so-called *boiled oil* is produced. *Linseed oil* has a S.G. of about 0·932, and is occasionally adulterated with resin oil, other seed oils, and paraffin oils. The oil resides in the albumenous tissue and cotyledons, while the mucilage resides in the integuments of the seeds, there is, therefore, no need to bruise them when this latter constituent only has to be removed.

Oil cake is the residue after the expression of the oil, and is used for feeding cattle.

Linseed meal was formerly English oil cake ground to powder, and contained but little oil. Now the crushed seeds containing all the oil are official.

Linen and lint (linteum carptum—scraped linen) are the specially-prepared and woven bast or liber tissues of the flax plant; a lint prepared from cotton is now, however, extensively used, and may be distinguished from true lint by means of the microscope and by other means.

Carron oil is a mixture of equal parts of linseed oil and limewater.

STERCULIÆ SEMINA.—Kola Nuts.—The seeds of Sterculia (Cola) acuminata, and of other species.

N.O.—Sterculiaceæ.

Syn.—Guru-nuts.

Habitat.—Tropical Western Africa.

Characters.—The seeds are about the size of horse chestnuts; more or less globular, of a fleshy consistence (unless dry); externally of a reddish violet colour, and internally of a dark violet tint when freshly cut. Taste slightly bitter, astringent and somewhat aromatic. Weight from 75 grains to 1 ounce.

Chemistry.—*Caffeine* 1½—2 per cent., glucose, *kola-red*, theobromine (traces), starch, nitrogenous matters, cellulose. The three first-named constituents are said to be products of the decomposition of a glucoside present in the fresh seeds.

Uses, etc.—As a caffeinic tonic; frequently prescribed in the form of a liquid extract (N.F.); "Kola wines" are also prepared from it.

Note.—GARCINIA KOLA (*Male Kola*, or "*Kola bitter*") yields seeds easily distinguishable from true Kola by their trigonal section and easily removable testa covered with numerous depressions. The seeds of HERITIERA LITTORALIS, occasionally found mixed with Kola Nuts, are flattened, orbicular, and have but one cotyledon double the size of the other. The seeds of neither of these contains caffeine.

GUARANA.—Brazilian Cocoa.—A dried paste prepared from the crushed or ground seeds (deprived of their aril) of Paullinia sorbilis.

N.O.—Sapindaceæ.

Syn.—Paullinia.

Habitat.—South America.

Characters.—Sub-globular elliptic or cylindrical cakes, hard, dark reddish-brown, fracture uneven, somewhat glossy, showing fragments of seeds invested with a black testa; odour slight, peculiar, resembling chocolate; taste astringent, bitter. It is partly soluble in water and in alcohol.

Chemistry.—*Guaranine* (2 to 5 per cent., identical with caffeine) starch, gum, greenish fat, tannin, saponin, and volatile oil; ash, 2½ per cent.

Uses, etc.—As a caffeinic stimulant given in form of powder, syrup, and elixir (B.P.C.), fluid extract (U.S.P.) *Dose*, 20—30 grains in powder.

TONKA FABA.—Tonquin beans.—The seeds of Dipteryx odorata (Coumarouna odorata).

N.O.—Leguminosæ.

Habitat.—Guiana.

Characters.—From an inch to an inch and a half long, from two to four lines broad; usually somewhat compressed, with dark brown, wrinkled, shining, thin, and brittle testa, and a light brown, oily kernel. Odour strong, agreeable, and aromatic; taste bitter and aromatic.

Chemistry.—*Coumarin* ($C_9H_6O_2$, the anhydride of coumarinic acid), fixed oils, mucilage and sugar. Coumarin, which is also found in Melilotus officinalis, is a volatile, crystalline, odorous principle, sparingly soluble in water.

Uses, etc.—As a flavouring agent and in perfumery.

PHYSOSTIGMATIS SEMEN.—Calabar Bean.—The dried seed of Physostigma venenosum.

N.O.—Leguminosæ.

Syn.—Ordeal Bean.

Habitat.—Western Africa.

Characters.—Measuring from about one inch to one inch and a quarter long, three quarters of an inch broad, and half an inch or somewhat more in thickness; oblong and more or less reniform, and with a long broad blackish furrow (the hilum) running entirely along its convex side, terminating in the micropyle, a pin-hole like indentation. Testa hard, brittle, roughish, deep chocolate-brown or brownish-red, and enclosing a closely-adhering nucleus which principally consists of two hard white brittle cotyledons separated from each other by a somewhat large cavity. Inodorous, and no marked taste beyond that of an ordinary bean. It yields its virtues to alcohol, and imperfectly to water. The cotyledons, when moistened with solution of potash acquire a permanent pale yellow colour.

Chemistry.—The alkaloids, *eserine* or *physostigmine* ($C_{15}H_{21}N_3O_2$) and *calabarine*, starch (48 per cent.), legumin (23 per cent.), fatty oil ($\frac{1}{2}$ to $\frac{1}{3}$ per cent.), mucilage, sugar, with ash, chiefly phosphate of potassium (3 per cent.)

PHYSOSTIGMINE contracts the pupil of the eye. Its dose internally is $\frac{1}{35}$ to $\frac{1}{10}$ of a grain; hypodermically $\frac{1}{40}$ of a grain. It is obtained from the alcoholic extract of calabar bean, by dissolving the extract in water, adding sodium bicarbonate, shaking the mixture with ether, and evaporating the ethereal liquid. It occurs in colourless or pinkish crystals, slightly soluble in water, but readily soluble in alcohol and in dilute acids. Its aqueous solution has an alkaline reaction, and when shaken with dilute solution of potassic hydrate it becomes red, and when evaporated to dryness over the water-bath, with ammonia, leaves a bluish residue, the acidified solution of which is beautifully dichroic, being blue and red. The hydro-bromate, sulphate and salicylate are official in some of the foreign Pharmacopœias.

Uses, etc.—Powerful sedative, contracts the pupil of the eye.

Dose—1 to 4 grains, in powder.

B.P. Preparations.

Extractum Physostigmatis (alcoholic; yield 2—2½ %).
Physostigmina *(made from the extract).*
Lamellae Physostigminæ, 1 in 5000 of physostigmine.

Note.—The seeds of MUCUNA (PHYSOSTIGMA) CYLINDROSPERMUM, which are longer, nearly cylindrical, of a reddish-brown colour, and with an extremely large hilum, are said to have been substituted for Calabar beans. The seeds of ENTADA SCANDENS, another reputed adulterant, are circular, one or two inches in diameter, one-third of an inch thick, and possess a very small hilum.

FŒNUM GRÆCUM.—Fænugreck.—The dried seeds of Trigonella Fœnum græcum.

N.O.—Leguminosæ.

Syn.—Fenugreek.

Habitat.—W. Asia (and cultivated).

Characters.—Oblong-cylindrical, somewhat compressed, obliquely truncate at each extremity, one or two lines in length, brownish-yellow externally, yellow internally, and marked with an oblique furrow running half their length; odour peculiar; taste oily, bitterish, and farinaceous.

Chemistry.—Fixed and volatile oil, mucilage, *trigonelline*, choline and proteids.

Uses, etc.—Anciently made use of for poultices and emollient purposes, is now much used for curries and and cattle medicines.

ABRI SEMINA.—Prayer Beads.—The seeds of Abrus Precatorius (Indian liquorice).

N.O.—Leguminosæ.

Syn.—Jequiriti seeds.

Habitat.—India.

Characters.—Globular ovate, about one-fifth of an inch long, scarlet red, glossy, with a black spot surrounding the hilum; the testa is hard, and encloses a whitish fleshy embryo. No odour, and a slight bean-like taste.

Chemistry.—*Abric acid, abrin* and fixed oil, etc. The activity of the seeds is due to the presence of abrin, which is a proteid body.

Uses, etc.—Each seed weighs about one carat, and they are, therefore, used in India as a standard of weight. An infusion of the seeds has a strongly irritating effect upon the eyes, and has been used both to produce and to allay certain ophthalmic diseases.

ARACHIDIS SEMINA.—Ground Nuts.—The seeds of Arachis Hypogœa.

N.O.—Leguminosæ.

Syn.—Earth-nuts; Pea-nuts.

Habitat.—India, etc.

Characters.—The seeds have a dry, brittle envelope and a yellowish-white kernel. The fruit ripens under ground,

Chemistry.—Fixed non-drying oil, 45 per cent., containing *hypogæic, arachidic*, oleic, and palmitic acids.

Uses, etc.—The seeds are edible, but their chief use is for the production of the oil (oleum arachis), which is known in India as *Katchung oil;* it is much used as a lubricant, as an illuminant, and for adulteration of more valuable oils.

BONDUCELLÆ SEMINA.—Bonduc Seeds.—

The seeds of Cæsalpinia Bonducella.

N.O.—Leguminosæ.

Syn.—Nicker Seeds.

Habitat.—Tropical Asia, etc.

Characters.—About the size and shape of marbles, and of a dull grey colour; externally smooth and hard, internally white.

Chemistry.—Fixed oil, resin, and a bitter principle.

Uses, etc.—These seeds are official in the Indian Pharmacopœia. They have tonic bitter properties. *Dose,* 10—15 grains (in powder).

AMYGDALA AMARA.—Bitter Almond.—

The ripe seed of the bitter almond tree, Prunus Amygdalus *var.* amara (Amygdalus communis *var.* amara).

N.O.—Rosaceæ.

Habitat.—Mogadore.

Characters.—Resembles the sweet almond in appearance, but is distinguished by being broader and shorter, by its very bitter taste, and by its aqueous emulsion having an odour like that of ratafia or of peach-blossoms.

Chemistry.—Fixed oil (45 per cent.); sugar and gum (5 to 10 per cent.); albumen and *emulsin* (24 per cent.); *amygdalin* $C_{20}H_{27}NO_{11}$ (2·5 per cent.); and inorganic salts (5 per cent.) By distillation with water, before or after the expression of the fixed oil, the seeds of this variety yield *essential oil of almonds.* This is the result of the action of the nitrogenous ferment, emulsin, upon the nitrogenous glucoside amygdalin in the presence of water. Both amygdalin and emulsin are present in bitter almonds, but the latter only in sweet almonds, hydrocyanic acid being produced at the same time. The yield of oil is from 1 to 3 per cent. In the crude state it consists of benzoic aldehyde (C_6H_5COH) with from 8 to 15 per cent. of hydrocyanic acid. By distillation over milk of lime and ferrous chloride or sulphate, the oil is freed from this poisonous ingredient and rendered comparatively innocent.

THE ESSENTIAL OIL thus obtained is a colourless or yellowish thin liquid, of a peculiar aromatic odour, a bitter and burning taste, and a neutral reaction. S.G. 1·060 to 1·070 (after removal of hydrocyanic acid 1·043 to 1·049). Soluble in 300 parts of water; in alcohol, and in ether in all proportions; also in nitric acid, at the ordinary temperature, without the evolution of nitrous fumes. When heated to 80°C. the oil should yield no distillate, having the odour or characteristics of chloroform or alcohol. If one part of the oil be dissolved in four parts of alcohol, one part of caustic potash added, and the mixture heated for a few minutes, when evaporated to one-third and cooled, the resulting liquid should have a brownish-yellow colour, and should be soluble in water with but slight turbidity, but without depositing a brownish-yellow sediment (a proof of the absence of nitro-benzol or oil of mirbane). Nitro-benzol has a S.G. of 1·18 to 1·201, and by nascent hydrogen yields aniline, which, by oxidising agents, gives a purple colour; advantage may be taken of this reaction for its detection. An artificial benzaldehyde is not infrequently used in perfumery, being cheaper than the essential oil of almonds, and more agreeable and less dangerous than nitro-benzol.

OLEUM AMYGDALÆ B.P.—The fixed oil which is obtained from both varieties of almonds, the products being identical, is of a pale yellow colour, nearly inodorous, with a bland oleaginous nutty taste. Its S.G. is ·914 to ·920. It remains clear when cooled to about 20°C. It consists of *olein* (about 76 per cent.) and a mixture of *palmitin* and *stearin* (about 24 per cent.) It is a non-drying oil and forms a firm, nearly white, elaidin with nitrous acid. The oil is frequently adulterated with apricot and peach kernel oils, and oils of the seeds of poppy, rape and cotton. The best tests are the congelation and elaidin tests (see above), and the German official test, with nitric acid, which is as follows:—Fifteen parts of the oil when agitated with a mixture of 5 parts of nitric acid (S.G. 1·5) and 2 parts of water should give a mixture neither brown nor red, but whitish.

Uses, etc.—Bitter almonds are used for preparing the fixed and volatile oils.

B.P. Preparations.

Oleum Amygdalæ, *from which are prepared:—*
Oleum Phosphoratum (about 1 in 200 of phosphorus.)
Unguentum Cetacei.
,, Resinæ.
,, Simplex *(and the preparations containing it).*

Preparations other than B.P.—Of these there are several, including aqua (U.S.P., P.G., etc.), essential oil (U.S.P,, Fr. Codex, etc.)

Note.—OL. AMYGDALÆ PERSIC. and OL. AMYGDAL. ESSENT. PERSIC. are the fixed and volatile oils respectively of the kernels of the peach and apricot.

AMYGDALA DULCIS.—Sweet Almond.—

The ripe seed of the almond tree, Prunus Amygdalus *var.* dulcis (Amygdalus communis *var.* dulcis). Imported from Malaga, and known as the Jordan almond.

N.O.—Rosaceæ.

Habitat.—Malaga.

Characters.—About an inch or somewhat more in length, nearly oblong in form, more or less compressed, pointed at one end and rounded at the other, and covered by a scurfy cinnamon-brown coat. It has a bland sweet nutty taste, and when triturated with water forms a white emulsion of an agreeable taste, but without any marked odour.

The botanical characters of the two varieties of almonds are nearly identical, the chief differences lying in the size and shape of the fruit (a drupe), thickness of shell, and taste of kernel.

The sarcocarp is not succulent and the endocarp is woody. Sweet almonds not only come from Mogadore but also from Valencia, Sicily, and Barbary. When deprived of the testa, they are called "blanched" almonds.

Chemistry.—Fixed oil (50 per cent.); sugar and gum (5 to 10 per cent.); albumen (24 per cent.); inorganic salts (5 per cent.); and *emulsin.* There being no amygdalin present in sweet almonds neither benzaldehyde nor hydrocyanic acid are obtained when the seeds are moistened with water.

Uses, etc.—Sweet almonds are used for preparing the fixed oil of almonds, and in the following pharmaceutical preparations.

B.P. Preparations.

Oleum Amygdalæ - -	yield, about 50 per cent.
Mistura Amygdalæ - -	1 part to 8 of distilled water.
Pulvis Amygdalæ Compositus	8 parts in 13.

CYDONIUM.—Quince.—The seeds of Cydonia vulgaris (the common quince tree).

N.O.—Rosaceæ.

Habitat.—Europe.

Characters.—About a quarter of an inch long, oval or oblong, triangularly compressed, brown, covered with a whitish, mucilaginous epithelium, causing the seeds to cohere to one another. With water the seeds swell up, and form a mucilaginous mass. The unbroken seeds have an insipid taste and no odour.

Chemistry.—Contain a mucilaginous principle, *cydonin* (20 per cent.) It differs from arabin in not being precipitated by silicate of potassium, and from bassorin and cerasin by being soluble in hot and cold water.

Uses, etc.—Quince seeds yield a strong soluble mucilage; for this purpose they were formerly official in the United States Pharmacopœia.

CAFFEA.—Coffee.—The roasted albumen of the seeds of Coffea arabica.

N.O.—Rubiaceæ.

Habitat.—Western Africa (and cultivated).

Characters.—The fruit is inferior, roundish, umbilicate at the top, at first green, then red, and ultimately purple; about the size of a cherry, succulent, and containing two seeds. Mocha coffee, which, when raw, occurs in small and dark yellow grains, is considered the best; Ceylon and West Indian kinds are of a bluish or greenish grey tint. All should be hard, tough, and almost tasteless and inodorous. Roasting the "berries" until they become friable, developes the characteristic bitter aromatic taste and fragrant odour. The word "*coffee berry*" is a misnomer, since this term cannot accurately be applied even to the fruit.

Chemistry of Roasted Coffee.—The composition is variable, depending upon the extent to which the coffee has been roasted. It contains fixed oil (12 to 20 per cent.), aromatic oil, *caffeine* (1-1½ per cent.), tannic acid, *caffeic acid;* albuminous matter (13 per cent.), gum and sugar (15 per cent.), ligneous matter (34 per cent.), and mineral matter (4 to 5 per cent.), the greater part of which is soluble in water. Silica and starch are absent. Coffee is frequently adulterated with roasted chicory, wheat, beans, acorns, etc. For the detection of these the microscope is useful, since the structure of genuine coffee is characteristic.

Uses, etc.—Coffee, in the form of infusion or decoction, is widely used as a beverage. Although its active principle is identical with that of tea, the action of coffee upon the system differs somewhat from that of the former. The difference has been variously ascribed to the decomposition changes which coffee undergoes during roasting, and to the action of the volatile constituents present in the "berries," Fluid extracts of green and of roasted coffee are included in the N.F.

Note.—For caffeine see under *tea*.

STROPHANTHUS.—Strophanthus.—The mature ripe seeds of Strophanthus hispidus (*var* Kombé), freed from the awns.

N.O.—Apocynaceæ.

Syn.—Kombé seeds.

Habitat.—Tropical Africa.

Characters.—Oval acuminate about three-fifths of an inch long, and one-tenth of an inch broad, the base narrowed, but blunt, the apex, when present, tapering to a fine extremity flattened at the sides, the dorsal surface being more or less convex; greenish-fawn in colour; covered with adpressed silky hairs; one side with a longitudinal ridge running from the centre to the pointed apex. Kernel white and oily, consisting of a straight embryo with thin cotyledons surrounded by a thin albumen; odour characteristic; taste very bitter. After soaking in water the seed-coat may be easily removed.

The seeds are sometimes imported in the follicles, which are linear-oblong, 8-12 inches in length and pointed; usually, however, the drug is met with in the form of awnless seeds.

Chemistry.—*Strophanthin* ($C_{31}H_{48}O_{12}$, a glucoside) and *kombic acid*. The former readily breaks up under the action of acids into glucose and *strophanthidin*. Strophanthin is said to be identical with *ouabaïn*, the active principle of the Somalis arrow poison Ouabaïo.

Uses, etc.—As a cardiac sedative.

B.P. Preparation.

Tinctura Strophanthi, 1 part of seeds, previously treated with æther, in 20 fluid parts of rectified spirit.

Note.—The seeds of S. DICHOTOMUS and of KICKSIA AFRICANA are sometimes met with either mixed with or substituted for true Strophanthus seeds; the former resemble the official variety, but are brownish and have fewer hairs, while the latter are pointed at both ends and are awnless.

NUX VOMICA.—**Nux Vomica.**—The seeds of Strychnos Nux Vomica.

N.O.—Loganiaceæ.

Syn.—Poison-nut, semen strychni.

Habitat.—East Indies.

Characters.—Rounded orbicular, from about seven-eighths of an inch to more than an inch in diameter, and on an average nearly a quarter of an inch thick; flattish or concavo-convex, or sometimes more or less bent or irregular in form, rounded or somewhat acute at the margin; marked on one surface by a central scar or hilum, from which a more or less projecting line passes to the margin, where it terminates in a slight prominence. Externally ash-grey or yellowish-grey-green, and glistening from being covered with short satiny hairs; internally horny and somewhat translucent; no odour, but an extremely bitter taste.

The seed may be best examined by softening it in hot water; it may be then divided into two discs of albumen, enclosing, near the margin, a thin, leafy embryo, the position of which is indicated by a minute depression at the circumference, corresponding to the extremity of the radicle (and the chalaza). In the centre of the concave side is the hilum; the more or less projecting line passing from it to the margin is the rhaphe. The embryo is about three-eights of an inch long; the cotyledons are cordate or ovate, and acute.

Chemistry.—*Strychnine* ($\frac{1}{4}$-$\frac{1}{2}$ per cent.), *brucine* (0·5 to 1·0 per cent.), *igasurine* (said to be impure brucine), in combination with *igasuric* or *strychnic acid*, forming igasurates; sugar (6 per cent.), which reduces Fehling's solution; fat (4 per cent.) and *loganin*, a glucoside. Strychnine is not coloured by strong sulphuric acid, and but slightly by strong nitric acid in the cold. Brucine, by nitric acid, is turned to a blood-red colour, which becomes violet on the addition of stannous chloride.

STRYCHNINE ($C_{21}H_{22}N_2O_3$).—To prepare this alkaloid the nuts are reduced to powder by drying for many hours at a temperature of 100°C. (212°F.) and grinding, the powder is exhausted by spirit mixed with half its weight of water. The liquor is filtered and evaporated to remove alcohol, and to the product acetate of lead is added until no further precipitate of tannin and colouring matters is obtained. Excess of lead is removed by hydrogen sulphide and the filtrate concentrated by evaporation. The bases are next thrown down by ammonia, collected, dissolved in alcohol, and separated by crystallization. The strychnia separates out first, leaving brucia in the mother liquor.

Strychnine so obtained crystallizes in trimetric prisms. It dissolves in 180 parts of amyl alcohol, in 5 parts of chloroform, and is nearly insoluble in water, to which, however, it lends a bitter taste. It gives the reactions common to alkaloids, and may be detected in quantities as small as ·00001 gram by the following test:—If to a solution in strong sulphuric acid an oxidising agent, such as potassic bichromate or peroxide of lead be added, a blue colour changing through purple to crimson and brick red is produced. If brucine be absent a solution of strychnine in nitric acid should be colourless or very faintly yellow. The following salts of strychnine have been prepared :—Sulphate, acetate, hydriodate, hydrobromate, hydrochlorate, and nitrate.

Brucine ($C_{23}H_{26}N_2O_4,4H_2O$) is obtained from the mother liquor of the crystallization of strychnine in colourless crystals containing about 15 per cent. of water. Like strychnine it is but slightly soluble in water, but dissolves in 20 parts of rectified spirit and in 2 parts of chloroform.

Uses, etc.—Nux Vomica is largely used both in the form of galenical preparations, and as a source of strychnine. It is a powerful spinal nerve tonic and highly poisonous.

B.P. Preparations.

Extractum Nucis Vomicæ (15 per cent. of alkaloids; yield of extract about 10 per cent., made with diluted spirit).
* Strychnina.
Tinctura Nucis Vomicæ (133 grains extract, 4 oz. of water, with rectified spirit to make 1 pint ; contains 1 grain alkaloid in 1 fluid oz.)

* *Used in preparing* Liquor Strychninæ Hydrochloratis (1 in 100).

Preparations other than B.P.—These are very numerous, comprising a fluid extract of the seeds (U.S.P.), salts of strychnine, *e.g.*, sulphate (U.S,P.), and citrate of strychnine with iron, and with iron and quinine, and a large variety of syrups, including that of Easton *(syrup ferri et quininæ et strychninæ bhosphatis*, B.P.C.), and many others.

Note.—The extract and the tincture of Nux Vomica are *standardized preparations*, *i.e.*, definite volumes or weights must contain a fixed quantity of alkaloid. This provision, made during the last few years, is highly necessary, since formerly preparations of this drug were very variable in strength, and hence either dangerous or useless.

IGNATIA.—Bean of St. Ignatius.—The seed of Strychnos Ignatii.

N.O.—Loganiaceæ.

Syn.—Faba Ignatii.

Habitat.—Phillipine Islands.

Characters.—About one and a fifth inch long, oblong or ovate, irregularly angular, dull brownish or blackish, covered with silvery appressed hairs, very hard, horny ; fracture granular, irregular ; the albumen somewhat translucent, enclosing an irregular cavity with an oblong embryo ; inodorous ; very bitter. About twenty seeds are contained in each pyriform fruit.

Chemistry.—The same as Nux Vomica ; the strychnine being present in somewhat greater quantity.

Uses, etc.—Much the same as Nux Vomica ; official in Fr. Codex. An extract and tincture (non-official) are prepared from the beans.

Note.—Other species of Strychnos are—Str. potatorum (the Indian *Nirmulee)*, used by the Hindoos for clearing muddy water, which they effect by means of the albumen they contain. Str. colubrina, yielding "*lignum colubrinum.*" Str. gaultheriana, the source of the Chinese *Poang-nan*. *Akazga* (Bourdu) an African drug, is also said to be derived from an unknown species of Strychnos.

STRAMONII SEMINA.—Stramonium Seeds.—The dried ripe seeds of Datura Stramonium.

N.O.—Solanaceæ.

Syn.—Thorn-apple seed.

Habitat.—Britain.

Characters.—About one-sixth of an inch long, reniform, flattened, brownish-black, finely pitted and wrinkled. Odour disagreeable when bruised; taste bitterish. The testa yields a tincture exhibiting a green fluorescence. The albumen is oily, and encloses a curved embryo.

Chemistry.—*Daturine*, in combination with malic acid. This alkaloid is said to be a mixture of atropine and hyoscyamine. Fixed oil (25 per cent.), mucilage, resin, and ash (3 per cent.) are also present. " Light " daturine is hyoscyamine.

Uses, etc.—As an anti-spasmodic; Stramonium dilates the pupil of the eye.

B.P. Preparations.

Extractum Stramonii, made with proof spirit from the seeds previously washed with æther.

Tinctura Stramonii, 54 grains to 1 fluid oz. of proof spirit.

Note.—The seeds of DATURA ALBA (*Dhatura* of India) have much the same composition as those of the above species.

HYOSCYAMI SEMINA.—Hyoscyamus Seeds.—The seeds of Hyoscyamus niger.

N.O.—Solanaceæ.

Syn.—Henbane seed.

Habitat.—Europe and Asia.

Characters.—One-sixteenth of an inch in length, roundish reniform flattened; testa of a grey-brown colour, finely and densely pitted; albumen oily, whitish, enclosing an embryo curved like the figure 9; inodorous · taste oily, bitter, and somewhat acrid.

Chemistry.—Fixed oil 25 per cent., resin, mucilage, proteids, *hyoscyamine*, and *hyoscine*.

Uses, etc.—Formerly official in several countries; now find use chiefly as a source of the alkaloid.

Note.—Belladonna seeds are of much the same size and shape, but are red-brown in colour.

CROTONIS SEMINA.—Croton Seeds.—The ripe seeds of Croton Tiglium.

N.O.—Euphorbiaceæ.

Syn.—Tiglium seeds.

Habitat.—India.

Characters.—Half an inch long, quadrangular, quarter of an inch broad with the rhaphe along ventral side; the surface of a dull brown colour which, when removed, discloses a black brittle testa; beneath this is a silky endopleura, enclosing an oily kernel; the cotyledons, of which there are two, are large, flat, and veined, the embryo lying at the thicker end of the seed. Odourless; taste at first oily, but afterwards acrid and burning.

Chemistry.—Fixed oil 50-60 per cent. (see Oleum Crotonis), proteids, and ash 3 per cent.

Uses, etc.—For preparing Croton Oil.

Note.—The seeds of CROTON OBLONGIFOLIUS (Calcutta), CROTON PAVANÆ (Assam), and those of CROTON POLYANDRUM are employed as purgatives, but are not so strong as the official.

RICINI SEMINA.—Castor Seeds.—The seeds of Ricinus Communis.

N.O.—Euphorbiaceæ.

Syn.—Semina Palmæ Christi.

Habitat.—Indigenous to Southern Asia (and cultivated).

Characters—The seeds, which are contained in a subglobular, somewhat triangular, grooved, smooth or mostly spiny tricoccous capsule, are oval, somewhat flattened, smooth, shining, of a grey colour, variegated with yellowish, brownish, or reddish spots and lines, with a slightly raised rhaphe along the flattish side, and a prominent caruncle or strophiole near one end. The embryo is straight, and has foliaceous heart-shaped cotyledons, and is imbedded in an oily albumen having a bland and slightly acrid taste. They are distinguished from Croton Seeds by being larger, having a mottled testa, and a more prominent strophiole.

Chemistry.—Fixed oil (50 per cent.); albumin (20 per cent.); sugar and mucilage (2·2 per cent.); cellulin (18 per cent.)—A body called *ricinine* has also been obtained from the seeds, originally described as an alkaloid its claim to that title has since been disputed, and it has even been regarded as a magnesium salt. The seeds, after the removal of the oil, are violently purgative, a property which is said to be due to the presence of a ferment which has been called *ricin*.

Uses, etc.—For obtaining castor oil. *(See Oleum Ricini.)*

Note.—The seeds of OMPHALEA OLEIFERA (N.O. Euphorbiaceæ) yield the purgative *Tambor oil* of Central America.

GRANA PARADISI.—Grains of Paradise.—The seeds of Amomum Melegueta and of Amomum Granum paradisi.

N.O.—Zingiberaceæ.

Syn.—Guinea grains.

Habitat.—W. Africa.

Characters.—Small, roundish or of an ovate form, and often angular or somewhat cuneiform; the testa is pitted and wrinkled; externally brown or reddish-brown, paler at the pointed (hilum) end; white within; of a feeble aromatic odour, and a strongly hot and peppery taste. They may be distinguished from Colchicum seeds by their size, shape, colour, and by the membranous tuft at the base of the seed.

Chemistry.—Volatile oil 0·3 per cent., tannin, fat, starch, resin, gum, and *paradol*; the latter, the active principle, is a viscid, pungent, straw-coloured fluid.

Uses, etc.—For cattle medicines and for imparting artificial strength to alcoholic beverages

COLCHICI SEMINA.—Colchicum Seeds.

The seeds of Colchicum autumnale, collected when fully ripe, which is commonly about the end of July or beginning of August; and carefully dried.

N.O.—Liliaceæ.

Syn.—Meadow-saffron seeds.

Habitat.—Indigenous.

Characters.—About one-tenth of an inch in diameter, subglobular, slightly pointed at the hilum, reddish-brown, somewhat rough, very hard and difficult to powder; no odour, taste bitter and acrid.

Chemistry.—Fixed oil, gum, starch, sugar, *colchicine* (an alkaloid, $C_{22}H_{25}NO_6$), decomposed by acids into *colchiceine* ($C_{21}H_{23}NO_6$), of which latter it is the methyl ester.

COLCHICINE ($C_{22}H_{25}NO_6$) is an amorphous, colourless or yellow alkaloid, soluble in alcohol and chloroform, and coloured yellow in solution by hydrochloric acid.

Uses, etc.—In rheumatism and similar disorders.

B.P. Preparation.

Tinctura Colchici Seminum, 54½ grains to 1 fluid ounce of proof spirit.

SABADILLA—Cevadilla.

—The dried ripe seed of Schœnocaulon officinale, (Asagræa officinalis, Veratrum officinale). The seeds are sometimes imported contained in, or mixed with their pericarps, but these should be rejected before the seeds are used.

N.O.—Liliaceæ.

Syn.—Cebadilla.

Habitat.—Mexico.

Characters.—About one quarter of an inch or less in length, narrow, fusiform, or somewhat scimitar-shaped, prolonged above into a membranous wing, somewhat compressed, shining, wrinkled, blackish-brown. Taste bitter, acrid; inodorous, but when powdered producing violent sneezing.

Chemistry.—Fat (containing a volatile fat acid, *sabadillic* or *cevadicacid)*, wax, mucilage, *veratric acid* and the following bases:—*Veratrine* ($C_{37}H_{53}NO_{11}$, decomposable into veratric acid and *verine)*, *cevadine* ($C_{32}H_{49}NO_9$, decomposable into cevadic acid and *cevine*), and *cevadilline* ($C_{34}H_{53}NO_8$). Recently (1891) two new alkaloids *sabadine* and *sabadinine* are reported to have been isolated from Sabadilla.

Uses, etc.—A powerful irritant, used for the destruction of vermin; rarely given internally.

B.P. Preparation.—Veratrina, *from which is prepared*
Unguentum Veratrinæ (7 grains in 1 oz.)

Veratrina.—The official Veratrine is a mixture of several or of all of the alkaloids present in Cevadilla and their decomposition products. It may be prepared by exhausting the powdered seeds with alcohol, removing (by distillation) the spirit from the solution so obtained, mixing the resulting concentrated solution with twelve times its volume of water, filtering and precipitating the aqueous solution with ammonia. The crude alkaloidal residue is then purified by dissolving it in hydrochloric acid, treating the solution with animal charcoal, and finally re-precipitating with ammonia, washing and drying. Thus obtained, Veratrine consists of pale, grey amorphous pulverulent masses, powerfully irritating the nostrils, strongly and persistently bitter, highly acrid and poisonous. It is soluble in 3 parts of chloroform and of rectified spirit; in 6 parts of æther, and only slightly in water even when boiling.

It dissolves in nitric acid, yielding a yellow solution; in sulphuric acid, forming a deep red solution having a green fluorescence by reflected light, and in warm hydrochloric acid with the production of a blood-red colour. Heated with access of air it melts into a yellow liquid and burns away leaving no residue.

ARECA.—Areca Nut.—The seed of Areca Catechu.

N.O —Palmaceæ.

Syn.—Betel Nut.

Habitat.--East Indies.

Characters.—The seed is about an inch long, roundish-conical in shape, and somewhat depressed at the base. It is of a brown colour externally, with numerous reddish veins originating in the hilum and forming a network which penetrates into the white albumen; the small embryo is situated near the base of the seed. The seeds are heavy, very hard, and have, when recently broken, a feeble, somewhat cheese-like odour, and an astringent, and slightly acrid taste. These "nuts," with unslacked lime and the leaves of the Betel pepper, form the celebrated masticatory of the East called "*betel.*" The albumen of the seeds is ruminated, but they differ from nutmegs in having a flat base.

Chemistry.—Fixed oil (14 per cent.), tannin (10-15 per cent.) and three alkaloids, viz.:—*arecoline* ($C_8H_{13}NO_2$), *arecaine* ($C_7H_{11}NO_2$), and a third. An aqueous extract of the seeds yields a kind of Catechu.

Uses, etc.—As a tænifuge, and on account of its astringent qualities as an ingredient of dentifrices. Areca charcoal is said to have distinctive properties. *Dose* for a dog:—60 grains.

SESAMUM.—Benne Seed.—The seeds of Sesamum indicum.

N.O.—Pedalineæ.

Syn.—Gingelli seeds.

Habitat.—S. Asia,

Characters.—Small, flattened, oval or ovate, varying in colour between whitish-yellow, reddish-brown, and blackish, finely punctate, and having four delicate longitudinal ridges; embryo straight, with plano-convex oily cotyledons.

Chemistry.—Fixed oil (50-56 per cent.), proteids and mucilage.

Uses, etc.—For preparing *benné oil.* (*See* Oleum Sesami.)

PEPO.—Pumpkin Seed.—The seed of Cucurbita Pepo.

N.O.—Cucurbitaceæ.

Habitat.—Tropical Asia and America.

Characters.—About three-quarters of an inch long, broadly ovate, flat, white or whitish, nearly smooth, with a shallow groove parallel to the edge; containing a short, conical radicle and two flat cotyledons; inodorous, bland, oily.

Chemistry.—Fixed oil (44 per cent.), starch (32 per cent.), traces of volatile oil, resin, and sugar.

Uses, etc.—A tænifuge: official in the United States.

Note.—The seeds of Cucumis Melo (the melon), of Cucumis sativus (the cucumber), and of Citrullus vulgaris (the water melon), have much the same constitution as the above, and also have anthelmintic properties.

THEOBROMA.—Cacao.—The seeds of Theobroma Cacao.

N.O.—Sterculiaceæ.

Syn.—Nux Cacao.

Habitat.—Tropical America (and cultivated).

Characters.—From one-half to three quarters of an inch long, ovate or oblong, somewhat flattened, and varying in colour according to mode of preparation, from brown-red to brown or greyish-brown. Testa is thin, papery, and easily broken; odour slight, but when warmed aromatic; the taste is oily, aromatic, and somewhat bitter.

Chemistry.—Fat (50 per cent.); starch (14 to 18 per cent.); nitrogenous substances (13 to 18 per cent.); *theobromine* (1·2 to 1·5 per cent.); ash (3·5 per cent.), etc.

Theobromine ($C_7H_8N_4O_2$)is an alkaloid closely allied to caffeine in both action and properties; forms feeble salts with alkalies, *e.g.*, sodium-theobromine.

Note.—The oil is obtained by pressing the seeds between hot iron plates or rollers. The pressed cake is used for the preparation of cocoa and the many articles sold under various names such as "cocoatina," "theobromine," "cocoa-essence," and chocolate. Chocolate is made by roasting the seeds, removing the integuments, grinding, triturating with sugar and flavouring agents such as vanilla, and colouring with annatto. Cocoa is prepared either by grinding up the seeds entire between hot rollers into a paste and then mixing with sugar and starch, when it constitutes "common or rock cocoa," or the roasted seeds are divested of their coats and broken into small fragments forming "cocoa nibs." The finer varieties of cocoa have much of the indigestible oil removed.

MYRISTICA—Nutmeg.—The dried kernel of the seed of Myristica fragrans (Myristica officinalis).

N.O.—Myristicaceæ.

Syn.—Nux Moschata.

Habitat.—Banda Islands of the Malayan Archipelago.

Characters.—Oval or roundish, varying in length, but rarely exceeding an inch, greyish-brown externally, and marked with reticulated furrows; internally greyish-red, with darker brownish-red veins, so that the transverse section has a marbled appearance. Odour strong and pleasantly aromatic; taste agreeably aromatic, warm, and bitterish.

The fruit of the nutmeg tree is a pendulous globose drupe, consisting of a succulent pericarp, an arillus (mace) covering the hard testa, and a wrinkled kernel. After the removal of the mace, the seeds are placed on hurdles or gratings and smoke-dried at 60°C., for about two months, by a slow wood fire. When dry they rattle in the shells, which are then cracked, and the bad kernels rejected. The Dutch nutmegs are usually covered with lime. The order of value is as follows:—(1) Penang, (2) Dutch, (3) Singapore, (4) Long ones (see note).

Chemistry.—Fat or expressed oil (25 per cent.); volatile oil (2 to 3 per cent.); starch and albumin.

Oleum myristicæ expressum B.P., the fixed oil, erroneously called "oil of mace," is a concrete oil obtained by expression and heat from nutmegs (usually those too small for sale). It is imported from Singapore in oblong blocks, ten inches by two and a half square, enveloped in palm leaves. It is soluble in four parts of warm alcohol, S.G. 0·800, and in ether. It contains 6 per cent. of volatile oil and 50 per cent. of *myristin* (myristicate of glyceryl), besides resin and other fats. Myristin, which is found also in spermaceti, is insoluble in cold alcohol.

Oleum myristicæ B.P., the volatile oil, is distilled in England from nutmegs, with water; it is colourless, or pale yellow; S.G. about ·930. It contains an oxygenated oil *myristicol* ($C_{10}H_{14}O$), which is isomeric with carvol and menthol, and a terpene *myristicene*($C_{10}H_{16}$).

Uses, etc.—Nutmegs are used in medicine as a stimulant and stomachic and largely also for flavouring purposes.

B.P. Preparations.

Oleum Myristicæ.†	
,, ,, Expressum.*	
Pulvis Catechu Compositus -	1 part in 10.
,, Cretæ Aromaticus - -	1 part in 16, nearly.
Spiritus Armoraciæ Compositus	½ ounce to 1 gallon.
Tinctura Lavendulæ Composita	75 gr. to 1 pint of rectified spirit.

† *1 in 50 with rectified spirit produces* Spiritus Myristicæ.
Contained also in Spiritus Ammoniæ aromaticus *and* Pilula Aloes Socotrina.

* *Contained in* Emplastrum Calefaciens *and* Emplastrum Picis.

Note.—Myristica fatua (wild, or male nutmegs—wild mace) has seeds the kernels of which constitute the "*long nutmegs*" of commerce. These are much longer and more cylindrical than the official kind, and possess the odour of nutmegs; they also have an arillus, yielding a mace which is insipid, and almost without odour.—Torreya Californica, a South American coniferous plant, is the source of the so-called *Californian nutmeg*. These are oblong and marbled in section, but their odour is distinctly terebinthinous. The *Jamaica* or *Calabash nutmeg* from Monodora myristica, the *New Holland*, or *plume nutmeg*, from Athenosperma Moschata, and the *clove nutmeg*, from Agathophyllum aromaticum, are not true nutmegs.

GYNOCARDIÆ SEMINA.—Chaulmoogra Seeds.—The seeds of Gynocardia odorata.

N.O.—Bixineæ.

Habitat.—Malayan Peninsula and E. India.

Characters.—Ovoid in form but somewhat irregular, being more or less angular. About one to one-and-a-quarter inches in length, and half an inch in breadth. The testa is brittle, smooth, and grey; nucleus oily and dark brown.

Chemistry.—Fatty oil (obtained by expression), albumin, etc; starch is not present. The oil, when pure, is pale and of a sherry colour.

Note.—Official in the Indian Pharmacopœia for the production of an ointment. There are prepared also from the oil an ointment (1 in 4) and *gynocardic acid.*

CURCAS.—Purging Nut.—The seed of Curcas purgans (Jatropha Curcas).

N.O.—Euphorbiaceæ.

Syn.—Semen ricini majoris.

Habitat.—Tropical America.

Characters.—About four-fifths of an inch long, ovate-oblong, with broad whitish hilum and caruncle at one end; dull black in colour; marked with numerous small cracks.

Chemistry.—Fixed oil 40 per cent., proteids and acrid resin.

Uses, etc.—The oil has properties similar to those of croton oil, but it is less powerful.

NIGELLA.—Fennel Flower.—The seeds of Nigella sativa and of N. damascena.

N.O.—Ranunculaceæ.

Syn.—Faux cumin.

Habitat.—S. Europe (and cultivated).

Characters.—About one-twelfth of an inch in length, triangular ovate, rough externally, dull black internally, white, and containing a small straight embryo. The seeds of N. damascena have a strawberry-like odour, and a deeply-wrinkled testa.

Chemistry.—Fixed oil (35 per cent.), volatile oil, and a glucoside *melanthin.*

Uses, etc.—As a condiment in the east; and also medicinally as a diuretic and expectorant.

ABELMOSCHI SEMINA.—Musk seed.—The seeds of Hibiscus Abelmoschus (Abelmoschus moschatus).

N.O.—Malvaceæ

Syn.—Ambretta.

Habitat.—India and Egypt.

Characters.—Flattish, reniform, one-eighth of an inch long, greyish-brown, concentrically striate, internally whitish and oily.

Uses, etc.—In perfumery as a substitute for musk; by the Arabs for flavouring coffee.

Note.—The fruit of HIBISCUS (ABELMOSCHUS) ESCULENTUS is cultivated in various parts of the world under the name of *gombo*, for the sake of its fruit, which contains much mucilage and which is used for thickening soup

2. ROOTS.—RADICES.

General Morphology of the Root.—The root is the descending and normally subterranean axis of the plant. When, as is frequently the case in dicotyledons, the radicle of the embryo elongates into a *primary* root, this becomes the root axis of the growing plant; but when, as in all monocotyledonous plants, the growth of the radicle ceases soon after the germination of the seed, the base of the shoot gives rise to a number of roots which, on account of their origin, belong to the class of so-called *secondary* or *adventitious* roots. Adventitious roots are found growing not only at the base of aërial shoots, but also as the rootlets of rhizomes, stolons, runners, etc.

Roots by duration are *annual*, *i.e.*, dying away at the end of one year's growth; *biennial*, *i.e.*, living for two years; *perennial*, *i.e.*, living on indefinitely from year to year. Both biennial and perennial roots commonly contain some stored food for the use of the plant. Subterranean roots possess very various forms, the most common of which are the simple, somewhat conical, and more or less branched *tap* roots of many dicotyledons, and the more or less thread-like *fibrous* roots of all monocotyledons Tap roots of biennial and perennial growth differ widely in form, *e.g.*, they may be *conical* (aconite), *fusiform* (radish), *napiform* (turnip) *tuberous* (jalap), *fascicled* (dahlia), *annular* (ipecacuanha). Aërial roots, *e.g.*, *climbing* (ivy) *epiphytic* (certain orchids), *parasitic* (mistletoe) are rarely, if ever, met with in medicine.

Histology of the Root.—The roots which are made use of in medicine are, in the great majority of cases, the "secondarily-thickened" roots of dicotyledons and differ entirely from the young root, the piliferous and primary cortical layers of which have long since sloughed off and been replaced by a jacket of cork. A transverse section of a typical dicotoledonous root, which has undergone secondary thickening, shows the following arrangement of the tissues:—Externally we find the cork layer or *periderm* enclosing an almost continuous ring of tissue mostly parenchyma, the thickness of which will vary according to the age of the root, and which constitutes the so-called *bast*, *phloëm* or *secondary cortex*. Internally to the bast lies the *cambium* ring, showing as a fine line of tissue and separating the bast from the *wood* or *xylem* which is arranged in wedge-shaped groups. Passing at right angles through the bast and wood and appearing in section as radiating lines are certain cellular plates, the so-called *medullary rays*. In the centre of the section will be a small column of pith, or, as is commonly the case with the older roots, the pith will have disappeared and the section will show a central speck around which the xylem groups are arranged. In tuberous roots (*vide supra*) the characteristic swelling takes place by the increase of the parenchymatous tissue, the cells of which become filled with stored food material. In addition to the above-mentioned fundamental tissues of roots, those made use of in medicine frequently possess *laticiferous tubes*, *vesicles*, *sacs*, and other *secretory reservoirs* which are the receptacles of those various secretions to which these roots owe their medicinal value.

General Chemical Characters of Roots.—In addition to such substances as cellulin, lignin, suberin, etc., present alike in roots and in all other complex masses of vegetable tissue, the former frequently contain other carbohydrates, the commonest form of which is starch. Amongst the Compositæ, however, inulin and in many other roots some form of sugar answers the purpose of reserve food material. Vegetable mucus or gum, produced probably by the alteration of the cell-walls, is a characteristic constituent of Malvaceous roots. The contents of the laticiferous vessels and other secretory reservoirs furnish the resins, gum-resins, alkaloids, glucosides, etc., which constitute the active principles of the medicinal roots.

ACONITI RADIX.—Aconite Root.—The root of Aconitum Napellus, collected in the winter or early spring before the leaves have appeared, from plants cultivated in Britain, and carefully dried; or imported in a dried state from Germany.

N.O.—Ranunculaceæ.

Syn.—Monkshood, Wolfsbane.

Habitat.—Germany, or cultivated in Britain.

Characters.—Usually from about one and a half to three inches long, and from half to three-quarters of an inch thick at the upper extremity, where it is usually crowned with the remains of the base of the stem; conical in form, much shrivelled longitudinally, and more or less covered with the scars or bases of broken rootlets; dark brown externally, whitish to pale brown within, and having a central cellular axis with about seven rays. No marked odour. Taste, at first, somewhat bitterish sweet, but exciting slowly, when chewed, after some minutes, a sensation of tingling and numbness, which lasts for some time.

Chemistry.—Alkaloid from ·3 to ·5 per cent. and consisting of *aconitine (nap-aconitine)* crystalline, acrid and highly toxic; *aconine*, *isaconitine (picraconitine)* and another alkaloid. Aconitine, the only crystallizable alkaloid, is present to the extent of not more than ·05 per cent., but to it is probably due the characteristic activity of the root since the other alkaloids are but little poisonous in comparison with it.

ACONITINE ($C_{33}H_{45}NO_{12}$) is the name now applied to the above-mentioned highly toxic crystalline alkaloid, formerly known as nap-aconitine. It must not be confused with commercial aconitine, which is a mixture of the latter with other amorphous bases. The pure alkaloid melts at 188°C., is soluble in 4400 parts of water, in 37 of alcohol, is dextro-rotatory in alcoholic solution, lævo-rotatory in acid solution, produces tingling sensation of tongue, and is not bitter.

Note.—The pure crystalline aconitine may be obtained by exhausting the root with amylic alcohol, agitating the liquid with dilute sulphuric acid, separating the acid liquid, agitating with chloroform to remove resin, etc., and precipitating the bases with carbonate of sodium. The precipitate is re-dissolved in a mixture of alcohol and ether and the aconitine allowed to crystallize.

The formula given above is one of several which have been ascribed to aconitine. The latest researches tend to show that the alkaloid is acetyl-benzoylaconine, having the formula $C_{34}H_{47}NO_{11}$, and splitting up on hydrolysis into isaconitine (or picraconitine) and acetic acid; aconine and benzoic acid being formed at the same time. Isaconitine ($C_{32}H_{45}NO_{10}$) would thus appear to be benzoyl-aconine, for aconine ($C_{25}H_{41}NO_9$) may be obtained from it by the action of alcoholic potash. The readiness with which aconitine undergoes hydrolysis may be taken as accounting for the marked loss of alkaloid which occurs in the preparation of those aconite galenicals requiring the application of heat.

Uses, etc.—Aconite root is largely used in medicine, chiefly as an anodyne and antipyretic; it is highly poisonous.

B.P. Preparations.

*Aconitina.
Linimentum Aconiti - - 1 in 1½ of rectified spirit.
Tinctura Aconiti - - - 1 in 8 of proof spirit.
**Used in preparing* Unguentum Aconitinæ, about 1 in 60.

Aconitina B.P. is a mixture of crystalline aconitine with three or more amorphous bases (*vide supra*). It is obtained by exhausting the root with rectified spirit, and on account of its varying composition, cannot but be regarded as being highly uncertain in its action; it is, however, one of the most powerful poisons known.

Preparations other than B.P.—Of these there are many, including fluid extract (U.S.P.), Fleming's tincture (1 in 1½), alcoholic extract (U.S.P., Fr. Codex, etc.), and 1 in 1 "chloroform of aconite" (non-official).

ACONITI HETEROPHYLLI RADIX.—Atis Root.

The dried root of Aconitum heterophyllum.

N.O.—Ranunculaceæ.

Habitat.—Western Temperate Himalayas.

Characters.—Ovoid or spindle-shaped tuberous roots, tapering downwards to a point, and from one-fourth to half an inch in thickness. The surface, which is covered with a thin greyish epidermis, is slightly wrinkled longitudinally and marked here and there with rootlet scars. Transverse section shows it to consist of a pure white friable amylaceous substance, marked by five or six concentrically-arranged dots, the terminations of threads of woody fibre traversing the root longitudinally. Inodorous, and of a bitter non-acrid taste.

Chemistry, etc.—This species does not contain aconitine and is non-poisonous. Its chief constituent is said to be an intensely bitter alkaloid, *atisine*, having a definite composition and possessing tonic and antiperiodic properties.

ACONITI INDICI RADIX.—Nepaul Aconite.—

The root of Aconitum ferox; known in India as Bikh or Bish.

N O.—Ranunculaceæ.

Syn.—Nepaul Aconite.

Habitat.—Nepaul, India.

Characters.—A conical root, not suddenly tapering, from two to four inches long, and one inch or more in diameter at its base, and much shrivelled longitudinally; of a lighter brown colour than the official variety, and at its base are often to be seen portions of the stem; the rootlet scars are much fewer than in the official root; internally hard and almost resinous; taste intensely acrid.

Chemistry, etc.—This root yields *pseudaconitine* (*napelline*), which is allied to aconitine and resembles it in many of its properties. It splits up into veratric acid and *pseudaconine*. With sulphuric acid and vanadium sulphate pseud-aconitine produces a violet red colour.

ACONITI JAPONICI RADIX.—Japanese Aconite Root.—The dried root of Aconitum Fischeri.

N.O.—Ranunculaceæ.

Syn.—Aconitum Chinense.

Habitat.—Japan.

Characters.—Conical or top-shaped tuberous roots, one to two inches in length, and about one-third to one inch in thickness at the base. Externally covered with a light or dark brown or greyish, closely adherent cuticle, with a few longitudinal and often some transverse wrinkles; internally white and amylaceous. The bases present distinct remains of one or more lateral stalks, and are in most specimens conical, but sometimes round, while a few are pointed. They are irregularly and scantily furnished with a few lateral rootlets, or only with the scars of these; average weight, 15 to 45 grains. Some roots do not contain much alkaloid, because of having been subjected to the process of steeping, when fresh, in a mixture of common salt, vinegar, and water, and subsequently dried.

Chemistry.—The poisonous alkaloid which is present is called *japaconitine*, to distinguish it from the official aconitine, and the pseudaconitine of A. ferox. Japaconitine is in all probability identical in constitution and in properties with the aconitine of A. napellus. ` It may be split up by the action of alcoholic potash into benzoic acid and *japaconine*.

Note.—The roots of A. CAMMANUM, A. STŒRKEANUM, A. ANTHORA, A. LYCOCTONUM, A. PALMATUM, and A. PANICULATUM contain bases which have not been thoroughly investigated.

PAREIRÆ RADIX.—Pareira Root.—The dried root of Chondrodendron tomentosum.

N.O.—Menispermaceæ.

Syn.—Pareira Brava—Wild Vine.

Habitat.—Brazil.

Characters.—Usually in long, nearly cylindrical, more or less twisted pieces, from about three-quarters of an inch to two or more inches thick; covered with a thin blackish-brown bark, and marked externally with longitudinal furrows and transverse ridges and fissures. Internally yellowish or brownish-grey, with well-marked concentric or more or less eccentric circles of porous wood, separated into wedge shaped portions by large medullary rays, and when cut presenting a waxy appearance in the inter-radial portions. No odour; taste bitter. Its decoction when cold is turned inky bluish-black by solution of iodine.

Chemistry.—*Cissampeline* or *pelosine*, said to be identical with beberine and buxine; a resin soluble in alcohol; starch, a yellow bitter principle and brown extractive.

Uses.—Chiefly used in the form of liquid extract as a diuretic and tonic.

B.P. Preparations.

Decoctum Pareiræ - -	$1\frac{1}{4}$ ounce to 1 pint.
Extractum Pareiræ - -	aqueous; yield, 15-20 per cent.
,, ,, liquidum,	1 of solid extract in 4 fluid parts.

Note.—ADULTERATIONS AND SUBSTITUTIONS.

The *stems*, which are sometimes found mixed with the roots, are lighter in colour, have lichens attached, and show their origin by possessing a small well-defined pith.

White Pareira Brava (ABUTA RUFESCENS) has a thick woody root, which exhibits numerous concentric layers, traversed by very distinct, dark medullary rays, the inter-radial spaces being white and rich in starch.

Pareira of 1867, said to have been obtained from CISSAMPELOS PAREIRA, possesses a root which differs from the Pareira of the present Pharmacopœia in having only one woody zone, and in being rarely so much as an inch in diameter. Its stems are somewhat lighter in colour and differ but little in structure from the root.

Common false Pareira.—Of this the botanical origin is unknown. The stems have a well-marked pith, the root very little. The arrangement of the woody zones is very eccentric, and the wavy appearance of true Pareira is absent. There is no starch present.

CALUMBÆ RADIX.—Calumba Root.—

The dried transversely cut slices of the root of Jateorrhiza Calumba (Cocculus palmatus).

N.O.—Menispermaceæ.

Syn.—Colombo root.

Habitat.—Forests of Eastern Africa.

Characters.—In irregular flattish, circular, or somewhat oval slices, from about an inch to two inches or more in diameter, and from one-eighth to half an inch or more in thickness. The cortical portion is thick, covered by a wrinkled brownish-yellow coat, and separated from the central portion, which is concave on both surfaces, by a fine dark-coloured line. The pieces have a greyish or greenish-yellow colour, a feeble, somewhat musty odour, bitter taste, break readily with a mealy fracture, and are easily reduced to powder. A decoction, when cold, is coloured bluish-black by a solution of iodine.

Chemistry.—*Calumbin* 1 per cent. (white crystalline), *berberine* (yellow crystalline), calumbic acid, starch (33 per cent.), pectin, gum, resin, and a small quantity of wax.

Uses, etc.—A much-used tonic. *Dose.*—5-20 grs. in powder.

B.P. Preparations.

Extractum Calumbæ - - -	made with proof spirit; yield about 8 per cent.
Infusum Calumbæ - - - -	1 to 20 of cold water.
Mistura Ferri Aromatica - -	1 to 32.
Tinctura Calumbæ - - -	1 in 8 of proof spirit.

Note.—ADULTERATIONS AND SUBSTITUTIONS.

Calumba root may readily be distinguished from all its adulterants and substitutions by noting the structure, hollow centre, and abundance of starch. The following are among some of the adulterants which have been noticed :—

(1.) The slices of the root of COSCINIUM FENESTRATUM (*N.O.*—Menispermaceæ. *Habitat.*—Ceylon). These are much larger and smoother than those of Calumba and have a different structure, are not hollow in the centre, and contain comparatively little starch. It is imported as "calumba wood ;" its properties are similar to those of calumba, and it contains berberine. Its decoction is not darkened so much as that of calumba by a solution of iodine.

(2.) The transversely sliced and dried root of BRYONIA DIOICA, WHITE BRYONY. (*N.O.*—Cucurbitaceæ. *Habitat.*—Britain). This resembles calumba root only in shape ; the slices are two to four inches in diameter and one-eighth of an inch or more in thickness, externally pale greyish-brown, transversely wrinkled ; internally white, with a thin bark, a brown cambium line, narrow wood bundles and broad medullary rays, and presenting an irregular radiating appearance from the projecting wood rays. The root is inodorous, and has a disagreeably bitter taste. A solution of iodine strikes very little or no colour when applied to the slices, indicating absence of starch.

(3.) The root of FRASERA WALTERI (F. CAROLINENSIS), AMERICAN COLUMBO. (*N.O.*—Gentianaceæ. *Habitat.*—North America.) It is dried in transverse slices, which are distinguishable from those of Calumba by the absence of the dark-coloured lines near the cambium.

ARMORACIÆ RADIX—Horseradish Root.

—The fresh root of Cochlearia Armoracia (*var* rusticana), most active in the autumn or early spring before the leaves have appeared.

N.O.—Cruciferæ.

Habitat.—Cultivated in Britain.

Characters.—Nearly cylindrical except at the upper end, where it is enlarged and conical, and marked in an annulated manner by the scars of fallen leaves. It is from half an inch to about an inch in diameter, and commonly a foot or more in length ; pale yellowish white or brownish white externally, whitish and fleshy within. Taste very pungent, but inodorous, except when scraped or bruised, when it exhales a characteristic pungent odour.

Chemistry.—The volatile oil, which is easily developed by scraping the root when in a fresh state, and to which its pungency is due, is known as sulpho-cyanate of butyl (C_4H_9CNS) and does not pre-exist in the root. It is the result of an action not unlike that which produces the volatile oil of mustard.

Uses, etc.—Little used in medicine, but has stimulant and rubefacient properties. Largely used in condiments.

B.P. Preparation.

Spiritus Armoraciæ Compositus - 1 in 8 fluid parts.

Note. This root is sometimes met with in the dried state, cut obliquely into pieces, from one-half to one inch long, and about a quarter to half an inch in diameter. It is then much shrivelled, and internally is whitish, and externally yellow-brown. It is said to have been mistaken for fresh aconite root, but this seems highly doubtful.

SENEGÆ RADIX.—The dried root of Polygala Senega.

N.O.—Polygalaceæ.

Syn.—Snake Root.

Habitat.—North America.

Characters.—Enlarged at the upper end into an irregular knotty tuberosity which bears the remains of numerous small stems, and tapering below into a more or less twisted or curved, branched, and usually keeled root, from one-fifth to more than one-third of an inch thick. Bark, yellowish or brownish grey, transversely cracked, horny, translucent; enclosing an irregular, whitish, central, woody column. Fracture, short, brittle; odour of bark peculiar, rancid, and its taste, at first, sweetish, but afterwards very acrid, sourish, and causing a flow of saliva; wood, tasteless and inodorous.

Chemistry.—The activity of senega, which resides in the cortical portion of the root, is due to the presence of an acid glucoside, *polygalic acid*, and a neutral glucoside, *senegin;* these are nearly allied to the similar products obtained from quillaya bark, and which form the active constituents of commercial saponin. A volatile oil (containing a salicylic ester), pectin, resin, fixed oil and sugar (6 per cent.) are the less important constituents.

Uses, etc.—Widely made use of as an emetic and expectorant.

B.P. Preparations.

Infusum Senegæ - - - 1 in 20.
Tinctura Senegæ - - - 1 in 8 of proof spirit.

Note.—SUBSTITUTIONS AND ADULTERATIONS.

American Ginseng.—The root of PANAX QUINQUEFOLIUM. (N.O.—Araliaceæ. *Hab.*—U.S.A.) Fusiform; from one and a half to three inches long; more yellow than senega from which it may also be distinguished by its greater freedom from wrinkles and twisting and the absence of a keel.

Common false Senega.—The root of POLYGALA BOYKINII. This closely resembles true senega, but is less twisted and has no keel; moreover, in cross-section it presents a circular woody column never as in senega, incomplete. It is much less acrid than the true drug.

Swallow-wort.—ASCLEPIAS VINCETOXICUM. (*N.O.*—Asclepiadaceæ. *Hab.*—Europe.) The rhizomes of the plant are nearly cylindrical, and are interrupted at intervals of one half to one inch by tufts of pale-brown rootlets. There is an evident pith and abundance of starch.

Cypripedium.—The rhizomes of C. PUBESCENS *q.v.* have been found substituted for senega root.

KRAMERIÆ RADIX.—Rhatany Root.—

The dried root of (1) Peruvian Rhatany, Krameria triandra; (2) Savanilla Rhatany, Krameria Ixina (K. tomentosa).

N.O.—Polygalaceæ.

Habitats.—(1) Peru. (2) Savanilla.

Syn.—Radix Ratanhiæ.

Characters.—(1) *Peruvian* or *Payta Rhatany* is in branched or unbranched pieces, varying in length and thickness. It consists of a hard brownish or reddish yellow woody axis, invested with readily separable bark, which varies in thickness from about one-twentieth to one-tenth of an inch, rough and scaly except in the smaller pieces, dark reddish brown externally, and bright brownish red on the inner surface.

(2) *Savanilla* or *Antilles Rhatany* is less irregular and knotty, and not so long or thick as the former. It is well characterised by its dark purplish or violet colour, and its smooth and thicker bark, which adheres firmly to the wood beneath and is usually marked at irregular intervals by deep transverse cracks. The bark of both kinds has a strongly astringent taste, and, when chewed, tinges the saliva red, but it has no marked odour. The wood is nearly tasteless and inodorous.

Chemistry.—A peculiar tannic acid called *ratanhia-tannic acid* (20 per cent.) which, by fusion with potassium hydrate, is converted into protocatechuic acid and phloroglucin. *Ratanhia-red* (the peculiar colouring matter), wax, gum, and uncrystallizable sugar are also present in the root. The activity of rhatany root seems to reside in the cortical portion. A strong tincture of these roots in brandy is used in Portugal to impart roughness to port wines. The constituents of the two official kinds of root are practically identical.

Uses, etc.—As an astringent, rarely given in the form of powder, of which the *dose* is 20-60 grains.

B.P. Preparations.—

Extractum Krameriæ - -	aqueous, dry; yield 20-25 per cent.
Infusum Krameriæ - -	1 in 20.
Pulvis Catechu compositus -	1 part in 5.
Tinctura Krameriæ - -	1 in 8 of proof spirit.

Note.—SUBSTITUTIONS.—*Para, Brazilian* or *Ceara rhatany*—the root of KRAMERIA ARGENTEA—varies in colour between dark grey and brown, and is remarkable for its elasticity. The bark adheres more firmly to the wood, and is longitudinally striated and transversely fissured.

Guayquil rhatany.—Origin unknown; is large and woody, one half to one or two inches in diameter, and is strongly contorted. The cortical portion is brown and fibrous, and the surface warty.

Texas rhatany, from KRAMERIA SECUNDIFLORA, has a root-stock about two inches thick, with a number of long, thin branching roots having a thick bark.

ALTHÆA.—Marshmallow.—The root of Althæa officinalis.

N.O.—Malvaceæ.

Syn.—Guimauve.

Habitat.—Europe (and cultivated).

Characters.—The root is cylindrical, branched, three to six inches long, and about the thickness of the middle finger, plump, mucilaginous, white and fleshy internally; externally it is white, deeply wrinkled longitudinally, marked with a number of small, nearly circular scars, and somewhat hairy from the presence of loosened bast fibres; when not decorticated it is covered with a yellowish or brownish, somewhat corky outer layer. Odour faint and aromatic; taste sweetish and mucilaginous.

Characters.—Mucilage (25 per cent.), starch (25 per cent.), pectin, sugar, *asparagin* or *althein* (8 per cent.), cellulose (7 per cent.), phosphate of calcium (8 per cent.) and a little fixed oil.

Uses, etc.—Much used for lozenge making on account of its mucilaginous nature. The *pâte de guimauve* as usually sold is a mixture of flour, gum, egg-albumen, sugar, etc. Marshmallow is included in the U.S.P., and the flowers (*fleurs de guimauve*) in the French Codex. A syrup of marshmallow is included in the foreign Pharmacopœias.

Note.—Most malvaceous plants possess well marked mucilaginous properties, and are employed for purposes where the latter are useful, in the localities where the plants are found.

GLYCYRRHIZÆ RADIX.—Liquorice Root.

—The root and subterranean stems or stolons, fresh and dried, of Glycyrrhiza glabra.

N.O.—Leguminosæ.

Syn.—Radix liquiritiæ.

Habitat.—Europe and W. Asia (and cultivated).

Characters.—When fresh, in long cylindrical pieces of varying thickness, smooth and yellowish brown or somewhat reddish externally, yellow and juicy internally, very flexible, easily cut, and consisting of a thick cortical portion surrounding a central woody axis, which in the case of the stem contains a small pith. Odour peculiar, earthy, and somewhat sickly; taste strong, peculiar, sweet. When dried it is either peeled or unpeeled. In the latter case it has essentially the same characters as the fresh root, except that it is somewhat darker, furrowed longitudinally, and has a slightly acrid and, in some cases, a feebly bitter taste, combined with the characteristic sweetness; but when peeled it has a yellow colour externally, and there is no acridity.

Chemistry.—*Glycyrrhizin* (a glucoside, 5 per cent.), resinous oil, asparagin, albumin, gum, starch, etc. Glycyrrhizin, to which the drug owes its sweetness, is not susceptible of vinous fermentation; is soluble in water, alcohol, and alkalies, and is precipitated by acids. It is decomposable into glucose and *glycyrretin*, a bitter substance. Being but slightly soluble in cold water, glycyrrhizin is present in but small quantity in the official extracts; it is itself comparatively tasteless, but gives sweet compounds with the alkalies, in combination with one of which it exists in the root.

Uses, etc.—Licorice is demulcent, expectorant, and slightly laxative. The powdered root is useful in pill-making on account of its drying qualities.

B.P. Preparations.

Confectio Terebinthinæ	1 part in 4, nearly.
Decoctum Sarsæ Compositum	¼ ounce in 1 pint.

†Extractum Glycyrrhizæ	made with cold water; yield 25-30 per cent.
*Extractum Glycyrrhizæ Liquidum,	made with cold water; preserved by addition of spirit.
Infusum Lini	100 grains to 1 pint.
Pilula Hydrargyri	1 part in 6.
„ Ferri Iodidi	1 part in $2\frac{3}{4}$, nearly.
Pulvis Glycyrrhizæ Compositus	1 part in 6.

†*Contained in* Conf. Sennæ, Dec. Aloes co., Tinct. Aloes, Troch. Opii

**Contained in* Mist. Sennæ co. and Tinct. Chlorof. et. Morp.

Note.—The decorticated root, which possesses less acridity, is to be preferred for pharmaceutical preparations. The English extract is obtained from Glycyrrhiza glabra (smooth) and typica (typical); the Spanish or Solazzi juice (in sticks) from Glycyrrhiza echinata (prickly); the Italian and Corigliano (in sticks or blocks) from Glycyrrhiza Calabria; and the Russian from Glycyrrhiza glandulifera. The Italian roots are sweetest and the Russian the most bitter. The official extract differs from "Spanish Juice" in composition, for while the former is prepared by cold maceration from dry root, the latter is obtained by boiling the fresh root; the former is soluble in water, the latter only partially so. Pomfrey or Pontefract cakes are prepared from the English-grown liquorice root. To the end of dissolving the glycyrrhizin the U.S.P. adopts the use of ammonia in preparing the extract and fluid extract, and includes an ammoniated glycyrrhizin *(Glycyrrhizinum ammoniatum)*, a scale preparation obtained by treating the root with ammonia water, precipitating the liquor with acid, dissolving the precipitated glycyrrhizin in ammonia and drying the solution on glass plates.

BRYONIA.—Bryony.—The root of Bryonia alba (black Bryony) and B. dioica (red Bryony), collected in the spring.

N.O.—Cucurbitaceæ.

Syn.—Mandrake.

Habitat.—Central and S. Europe.

Characters.—From 18 inches to 2 feet long and 2-4 inches thick; in the fresh state fleshy. Internally white, with a thin bark, brown cambium line, broad medullary rays, and numerous wood bundles arranged in radiating lines. Usually found in commerce in dried discs with a triangular radiating and concentic arrangement of the wood. The dried root is inodorous and has a bitter taste.

Chemistry.—*Bryonin* (a bitter glucoside), starch, gum, sugar, etc.

Uses, etc.—Applied externally in the fresh state the root has a vesicant action; internally it acts as a cathartic. A tincture (*B.P.C.*) is prepared (1 in 10) from spirit of such a strength as to produce a proof spirit tincture.

Note.—The Brazilian *Tayuya root* is said to be derived from a species of Bryonia.

SUMBUL RADIX.—Sumbul Root.—The dried transverse sections of the root of Ferula Sumbul (Euryangium Sumbul.

N.O.—Umbelliferæ.

Syn.—Jatamansi.

Habitat.—Russia and India.

Characters.—Varying much in size, but usually from about one inch to three inches in diameter, and from three-quarters of an inch to more than an inch in thickness. The pieces are covered on the outer surface with a dusky-brown papery transversely wrinkled bark, and are sometimes beset with short bristly fibres ; internally they are spongy, coarsely fibrous, dry, farinaceous, and dirty yellowish-brown, mottled with whitish patches and spots of exuded resin. Odour strong, musk-like ; taste bitter, aromatic.

Chemistry.—Volatile oil (0·3 per cent.), resin (9 per cent.; of a musk-like odour), angelic and valerianic acids ; by dry distillation yields umbelliferone.

Uses, etc.—In India a perfume as well as a medicine ; has nerve-tonic properties.

B.P. Preparation.

Tinctura Sumbul - - 1 in 8 of rectified spirit.

Note.—False Sumbul is the root of Dorema Ammoniacum ; it is of closer texture denser, and more firm, of a reddish or yellowish tint and feeble odour.

IPECACUANHA.—Ipecacuanha.—The dried root of Cephaëlis Ipecacuanha.

N.O.—Rubiaceæ.

Syn.—Ipecac.

Habitat.—Brazil.

Characters.—In more or less twisted pieces, usually from two to four inches long, and about the size of a small writing quill. It consists of two parts, namely, a central whitish woody axis, and a thick cortical portion, which is brownish, greyish-brown, or reddish-brown, irregularly annulated, and has a resinous or waxy fracture. Taste somewhat acrid and bitter ; odour slight and peculiar, more especially when powdered.

Chemistry.—Alkaloid (1·6 to 2·8 per cent.), in combination with *cephaëlic* or *ipecacuanhic acid*, and consisting chiefly of *emetine*. This alkaloid is amorphous and white when pure and fresh, but becomes yellowish. It is soluble in chloroform, ether, spirit, glycerine, and acetic acid ; sparingly in water. By the action of solution of chlorinated lime its solution in acetic acid assumes a permanent yellow colour. It resides chiefly in the cortical portion, which forms 80 per cent. of good roots. There is also present a second alkaloid, said to be crystalline, and little soluble in ether ; resin, fat, albumin, fermentable and crystallizable sugar, and a large quantity of pectose, starch, and lignin are also present. Commercial emetine is probably a mixture of emetine and cephaëline ; the relative physiological values of the two bases are so far not known.

Uses, etc.—Ipecacuanha is widely used as an expectorant and emetic. *Dose.*—As expectorant, ½-2 grains ; as an emetic, 15-30 grains. Under the title of "de-emetinized ipecac." the root, deprived of its alkaloidal substance, has been recommended for and used in chronic dysentery.

B.P. Preparations.

Pilula Conii Composita	1 part in 6, nearly.
,, Ipecacuanhæ cum Scilla	1 part in 23, about.
Pulvis Ipecacuanhæ Compositus	1 part in 10.
Trochisci Ipecacuanhæ	$\frac{1}{4}$ gr. in each lozenge.
,, Morphinæ et Ipecacuanhæ	$\frac{1}{12}$ gr. in each lozenge.
Vinum Ipecacuanhæ	22 grs. to 1 fluid oz.

Note.—COLLECTION, ETC.—Ipecacuanha plants are small and shrubby, and grow in clusters. The collection, which goes on all the year round, is carried on by "poayeros," who grasp the cluster with one hand and beat it with a stick with the other. A part of the root is left in the ground, from which another springs up. The petiole of a leaf is also capable of producing roots and buds. The gathered roots are dried in the sun and their colour varies, some being red, grey, brown, or even blackish (the best).

SUBSTITUTIONS AND ADULTERATIONS.

The *stems* of the official plant are frequently found to constitute as much as 30 per cent. of the drug when imported. Though of no official value they contain from 1 to $1\frac{1}{2}$ per cent. of alkaloid, and consequently afford a valuable source of emetine, if that be the alkaloid present.

Carthagena Ipecacuanha—the root of CEPHAELIS ACUMINATA—is larger or fatter than the official drug, is much less annulated, has a more resinous, very thick cortex and more evident medullary rays. It contains from 1·6 to 2 per cent. of alkaloid which, however, has not been shown to be emetine.

Striated or *Black Ipecacuanha*—the root of PSYCHOTRIA EMETICA (*N.O.*—Rubiaceæ. *Hab.*—Brazil) is distinguished by having longitudinal striæ and transverse constrictions at intervals (not annulations), resembling a string of sausages. The cortical portion is dark-coloured, especially on the addition of a little water; it remains soft and moist and tough to the knife even after many years; does not contain starch, and its essential constituent is emetine, which is present in but small quantity.

Undulated or Wavy Ipecacuanha—the root of RICHARDSONIA SCABRA. (*N.O.*—Rubiaceæ. *Hab.*—Brazil.) The root is undulated or wavy, and, when broken, dust (starch) falls out; it has a whitish, very thick and brittle cortical portion, and yields no emetine.

Ionidum or White Ipecacuanha—the root of IONIDUM IPECACUANHA. (*N.O.*—Violaceæ. *Hab.*—Brazil.) From two to four inches long, having at the base a knotty crown from which arise numerous aerial stems; below, twisted and branched; diameter one-sixteenth to three-eighths of an inch; cortical portion thin, wrinkled and shrivelled longitudinally, and of a light greyish colour; meditullium lighter; fracture short and brittle; little odour and taste; contains neither starch nor emetine.

TARAXACI RADIX.—Dandelion Root.—

The fresh and dried roots of Taraxacum officinale (Taraxacum dens-leonis); collected in the autumn from indigenous plants.

N.O.—Compositæ.

Syn.—Leontodon Taraxacum.

Habitat.—Britain.

Characters.—Root when fresh, frequently a foot or more in length, and half an inch or more in diameter, smooth and yellowish-brown externally, whitish within. It breaks readily with a short fracture, and a milky juice exudes; the fractured surface presenting faint concentric lines. When dried it is more or less shrivelled, deeply furrowed longitudinally, dark brown or blackish, breaks with a short fracture, and the exposed surface shows a yellow porous central woody axis, surrounded by a thick whitish bark, with a variable number, according to its size, of irregular well-marked concentric rings. Inodorous; taste bitter.

Chemistry.—*Taraxacin* (crystalline bitter), an acrid resin, *taraxacerin* and mannite. The dried root contains much inulin (24 per cent.), and about 19 per cent. of lævulose. Inosite or muscle-sugar is said to be present in the leaves and stalks of the plant.

Uses, etc.—Diuretic and feeble hepatic tonic.

B.P. Preparations.

Decoctum Taraxaci - made from dried root, 1 in 20.
Extractum Taraxaci, expressed from fresh root; yield in autumn about 10 per cent.
Extractum Taraxaci Liquidum, made from dried root.
Succus Taraxaci - expressed from fresh root.

Note.—"Any adherent leaves are runcinate and quite smooth."—B.P., 1867. This description was intended to distinguish the official plant from another species of the same genus, viz., Leontodon hispidus (Aspargia hispida), *hawkbit*. There is a difference of opinion as to the best time for collecting Dandelion roots. The yield of taraxacin is greater in spring, while the yield of inulin and other inert matters is greater in autumn. Since the activity of this plant is due to taraxacin it would seem right to collect when this happens to be present in greatest quantity, and it is generally agreed that it should never be gathered during frosty weather. On account of the variability of the constituents of the plant, according to the time of the year when it is gathered, the yield and composition of the official extract are very variable. If it be prepared from roots collected in autumn, the resulting product yields a turbid solution with water; if from spring-collected roots the aqueous solution will be clear and yield but very little sediment on standing, because of the conversion of the inulin into lævulose, at this active period of the plant's life.

SUBSTITUTIONS.—*Hawkbit root* and *Chicory root*. The latter is of a paler colour, more bitter, and has the milk-vessels in radiating lines.

CICHORII RADIX.—Wild Chicory.—The root of Cichorium Intybus.

N.O.—Compositæ.

Syn.—Succory.

Habitat.—Europe.

Characters.—When wild, woody; when cultivated, fleshy, and with a thicker cortex. It is several headed, ten to twelve inches long, branched, longitudinally wrinkled, light brown externally, whitish internally. The cortical portion somewhat thin, white, radially striate, from the dark-coloured laticiferous vessels, and separated by a brown cambium line from the finely porous yellow wood, marked by fine medullary rays, and one or more annual rings. Inodorous, and of a mucilaginous and bitter taste.

Chemistry.—Bitter principle, inulin, sugar, etc.

Uses, etc.—Has properties similar to those of Dandelion.

Note.—When dried, roasted, and coarsely powdered, chicory root is used as a substitute for, and an adulterant of, ground coffee. As it is itself extensively adulterated, it may rightly be objected to when present in coffee bought as genuine. It differs from coffee in the absence of volatile oil, rich aromatic flavour, caffeine and caffeo-tannic acid, and presence of a large amount of ash, including silica. In the roasted condition it is found to contain the following constituents:—Gum (9 to 14 per cent.), glucose (10 to 18 per cent.), caramel (20 to 30 per cent.), fatty matter (2 to 5 per cent. from lard used in the roasting process), burnt woody matter (28 per cent.), ash (4 to 7 per cent.), moisture (12 to 14 per cent.), and it yields 45 to 65 per cent. of soluble extractive matter.

HEMIDESMI RADIX—Hemidesmus Root. The dried root of Hemidesmus indicus.

N.O.—Asclepiadaceæ.

Syn.—Indian Sarsaparilla.

Habitat.—India.

Characters.—In cylindrical, more or less twisted longitudinally, furrowed pieces, six inches or more in length; covered by a thin yellowish-brown or brown corky layer, which is easily separated from the other portion of the bark, the latter being frequently cracked in an annular manner. Odour fragrant, resembling that of melilot or Tonquin bean; taste sweetish and very slightly acrid.

Chemistry.—Hemidesmine (a stearopten), starch, and in the suberous layer, tannic acid.

Uses, etc.—Though said to have medicinal value, its chief use is as a flavouring agent.

B.P. Preparation.

Syrupus Hemidesmi - - -	1 oz. to 10½ ozs.

ASCLEPIAS—Pleurisy Root.—The root of Asclepias tuberosa.

N.O.—Asclepiadaceæ.

Habitat.—United States of America.

Characters.—Large and fusiform, dried in longitudinal and transverse sections; from one to six inches long, and about three-quarters of an inch or more in thickness; the head knotty, and slightly, but distinctly annulate, the remainder longitudinally wrinkled; externally orange-brown, internally whitish; tough, and having an uneven fracture; bark thin, and in two distinct layers, the inner one whitish; wood yellowish, with large, white medullary rays; inodorous, and having a bitterish, somewhat acrid taste. When long kept it acquires a grey colour.

Chemistry.—A glucosidal principle, having the taste of the root, and precipitated by tannic acid; starch, gum, etc.

Uses, etc.—Sudorific and expectorant. *Dose.*—15-60 grains. Official in the U.S.P. for the preparation of a fluid extract.

Note.—The roots of ASCLEPIAS INCARNATA, A. CORNUTI, A. CURRASAVICA, all indigenous to the Continent of America, have properties similar to the above. ASCLEPIAS (CALOTROPIS) GIGANTEA, indigenous to India and Ceylon, is the source of the Indian *mudar-bark.*

GENTIANÆ RADIX.—Gentian Root.—The dried root of Gentiana lutea.

N.O.—Gentianaceæ.

Habitat.—Central and Southern Europe.

Characters.—In more or less cylindrical pieces or longitudinal slices, from a few inches to a foot or more in length, and from half an inch to about an inch thick; wrinkled in an annular manner when the pieces have been derived from the upper part of the root, and all marked with irregular longitudinal furrows; deep yellowish-brown externally, yellowish or reddish-yellow within; tough and brittle when dry. Bark thick, reddish, and separated from the central woody portion, which is somewhat spongy, by a dark-coloured cambium zone. Odour heavy and peculiar; taste at first sweetish, but ultimately very bitter. An infusion when cool is not coloured blue by solution of iodine.

Chemistry.—Uncrystallisable sugar (*gentianose*, 12 per cent.), much pectin, a little volatile oil and fat, *gentiopicrin* (the essential constituent) 0·1 per cent., and *gentisin*, *gentianic* or *gentisic acid* (inert); alcohol extracts its virtues completely.

Uses, etc.—One of the most widely used tonic-bitters. The Swiss and Tyrolese manufacture from it a "gentian brandy," which is much prized by them as a stomachic and pick-me-up.

B.P. Preparations.

Extractum Gentianæ, aqueous; yield about 50 per cent.
Infusum Gentianæ Compositum, 110 grs. to 1 pint.
Tinctura Gentianæ Composita, 1 in 13⅓ of proof spirit.

Note.—GENTIANA PURPUREA, G. PANNONICA, G. PUNCTATA are European gentians having similar medicinal properties to the above, and are used indiscriminately with each other and with the official roots, from which they differ but little in appearance. *American gentian root* is derived from G. PUBERULA, G. SAPONARIA, G. ANDREWSII. This drug also is said to have properties practically identical with those of the European varieties. Belladonna and aconite roots, and the rhizomes of orris and white hellebore, have been found mixed with gentian root.

INULA.—Elecampane.—The root of Inula Helenium.

N.O.—Compositæ.

Syn.—Radix Helenii.

Habitat.—Central and S. Europe (and cultivated).

Characters.—In transverse, concave slices or longitudinal sections, with over-lapping bark, externally wrinkled and brown; flexible in damp weather; when dry, breaking with a short fracture; internally greyish, fleshy, slightly radiate, and dotted with numerous shining, yellowish-brown resin cells; odour peculiar, violet-like, aromatic; taste bitter and pungent.

Chemistry.—Volatile oil (consisting of *alantol* and *alantic anhydride*), *helenin* (tasteless, crystalline), acrid resin, a bitter principle, wax, and *inulin*.

INULIN ($C_6H_{10}O_5,6H_2O$) is a starch-like compound, and apparently the anhydride of lævulose; it is a frequent constituent of composite plants, where it may be regarded as replacing the starch present in other roots.

Uses, etc.—Official in the U.S.P. A favourite domestic remedy for bronchitis, etc. *Dose.*—½-2 dr.

Note—INULA SQUARROSA and I. DYSENTERICA *(fleawort)* are used in domestic medicine in S. Europe.

PYRETHRI RADIX.—Pellitory Root.—The dried root of Anacyclus Pyrethrum.

N.O.—Compositæ.

Syn.—Roman pellitory.

Habitat.—South of Europe.

Characters.—In unbranched pieces, from two to four inches long, and from half to three-quarters of an inch thick, cylindrical or somewhat tapering, generally crowned with a small tuft of short white hairs, and covered by a thickish brown shrivelled bark studded by dark-coloured receptacles of resin.

Breaks with a close fracture, the yellowish fractured surface presenting a radiated appearance and numerous shining brown resin ducts. Inodorous, but when chewed causing a burning and pricking sensation over the whole mouth and throat.

Chemistry.—Pyrethrin (a red resin, soluble in potash solution), a resin insoluble in that alkali, a yellow acrid oil, inulin, gum, tannic acid, colouring matter, various salts, and ligneous fibre. The activity of the root is said to be due to a crystalline body for which the name *pellitorine* has been suggested.

Uses, etc.—Pellitory is a rubefacient, and when chewed produces a copious flow of saliva.

B.P. Preparation.

Tinctura Pyrethri - - - 1 in 5 of rectified spirit.

Note.—German Pellitory is the root of ANACYCLUS OFFICINARUM, a plant indigenous to Africa and cultivated in Germany. It is about half the thickness of the official root, and has often the remains of leaves and stalks attached. In pungency it is equal to the official drug.

ADULTERATIONS AND SUBSTITUTIONS.—Dandelion root looks a little like pellitory root, but close examination will show a difference in the internal structure, the former having a yellowish meditullium bordered by concentric brown rings, while the latter has a radiated structure.

FRASERA.—American Columbo.—The root of Frasera Walteri.

N.O.—Gentianaceæ.

Habitat.—United States.

Characters.—In longitudinal slices, about one inch in thickness, the upper portion annulate, the lower longitudinally wrinkled, externally pale orange-brown, internally light yellowish-brown; bark thick; odour gentian-like; taste sweetish and bitter.

Chemistry.—Gentiopicrin, the active principle of Gentian root, is present but in a smaller quantity than in the latter.

Uses, etc.—Much the same as Gentian. *Dose.*—15-30 grains.

ANCHUSÆ RADIX.—Anchusa Root.—The dried root of Anchusa tinctoria.

N.O.—Boraginaceæ.

Syn.—Alkanet.

Habitat.—South of Europe.

Characters.—In pieces from three to four inches long, from the thickness of a quill to that of the little finger, somewhat twisted, consisting of a dark red, easily separable bark and an internal ligneous portion, which is reddish externally and whitish near the centre, and composed of numerous distinct, slender, cohering fibres. Odour faint; taste bitterish and astringent.

Chemistry.—Alkannin (*anchusin* or *anchusic acid*) 5 per cent., the colouring principle, resides in the cortical portion, and is soluble in alcohol, ether, petroleum-benzine, and oils, but insoluble in water; with alkalies it becomes blue.

Uses, etc.—Chiefly for colouring oils and pomades.

SASSAFRAS RADIX.—Sassafras Root.—

The dried root, reduced to chips or shavings, of Sassafras officinale.

N.O.—Laurineæ.

Habitat.—North America.

Characters.—In large branched billets, more or less covered with bark. Bark rough and greyish-brown or rusty-brown externally ; internally smooth, glistening and rusty-brown, with an agreeable aromatic odour, and a peculiar aromatic, somewhat astringent taste. Wood soft, light in weight, greyish-yellow or greyish-red, with a similar taste and odour to the bark, but more feeble.

Chemistry.—Volatile oil (1 to 2 per cent.) is the essential constituent ; to it the odour and taste are due. The oil has a S.G., 1·09, and when exposed to cold it deposits crystals of *sassafras camphor ;* it consists of a stearopten, *safrol*, 90 per cent. (S.G., 1·114), the remainder being *saffrene*, a hydrocarbon of the terpene class, (S.G., 0·834.) The other constituents of the root are tannic acid and about 9 per cent. of a red colouring matter, resemblng cinchona red, called *sassafrid.*

Uses, etc.—Mostly as a flavouring agent. It has stimulant and diaphoretic properties.

B.P. Preparation.

Decoctum Sarsæ Compositum - - $\frac{1}{4}$ oz. to 1 pint.

Note.—The *bark* and *pith* of Sassafras are both official in the U.S.P. The former is given in infusion and has much the same composition as the wood; the latter, which occurs in slender cylindrical, often curved or coiled, spongy pieces, consists of parenchymatous tissue. and contains a large quantity of mucilage which is not precipitated from solution by alcohol ; it is useful on account of its demulcent properties.

SCAMMONIÆ RADIX.—Scammony Root.

The dried root of Convolvulus Scammonia.

N.O.—Convolvulaceæ.

Habitat.—Syria and Asia Minor.

Characters and Test.—Unbranched, often spirally twisted, of various lengths and sizes, cylindrical except towards its upper end where it is enlarged, and presents usually some remains of the slender aërial stems ; more or less shrivelled, longitudinally furrowed, greyish-brown or yellowish externally, pale brown or whitish within, and when fractured small fragments of pale yellowish-brown resin may often be seen on the surface of the fracture. Odour and taste faint, somewhat resembling jalap. Rectified spirit agitated with the powder and evaporated leaves a residue having the properties of scammony resin.

Chemistry.—Contains the resin *scammonin* (4 to 5 per cent.), gum (5 to 8 per cent.), sugar (24 to 48 per cent.), starch, extractive, cellulin and salts.

Uses, etc.—For the preparation of scammony resin.

B.P. Preparation.—Resina Scammoniæ.

SCAMMONY RESIN is obtained by making a tincture of the root with rectified spirit and precipitating the resin from solution by the addition of water; the precipitated resin is washed with hot water and dried at 100°C. By this means it is obtained in brownish translucent pieces, brittle, resinous in fracture and of a sweet fragrant odour when prepared from the root. It cannot, alone, form an emulsion with water (thus differing from scammony). Its spirituous tincture does not strike a blue colour when applied to the fresh-cut surface of a raw potato (near to an "eye"), indicating absence of guaiacum resin. Ether should dissolve it entirely (absence of jalap resin), but in commercial samples a little remains undissolved, varying from 0·2 to 1·0 per cent., this being resin altered by the heat used in evaporating the spirit in its preparation. The resin consists of *scammonin* ($C_{34}H_{56}O_{16}$) with a small quantity of colouring matter; scammonin is identical with *jalapin* (*orizabin*), the purgative principle of male Jalap.

Uses, etc.—A purgative, usually given in conjunction with other medicines. *Dose.*—3-8 grains.

B.P. Preparations of Scammony Resin.

Confectio Scammonii	1 part in 3, nearly.
Extractum Colocynthidis Compositum	1 part in 7, nearly.
Pilula Colocynthidis Composita	1 part in 3, nearly.
,, Scammonii Composita	1 part in 3, nearly.
Pulvis Scammonii Compositus	1 part in 2.

JALAPA.—Jalap.—The dried tubercules (swollen portions of roots) of Ipomœa Purga (Exogonium Purga).

N.O.—Convolvulaceæ.

Habitat.—Mexico.

Characters.—Irregularly oblong, somewhat ovoid, napiform, or rarely fusiform, hard, compact, varying much in size, the larger frequently incised, or cut into halves or quarters. Externally dark-brown, more or less irregularly furrowed and wrinkled, and marked with paler-coloured transverse lines or scars; internally dirty-yellowish or brownish, and frequently marked with dark-brown irregular concentric circles. Odour faint, peculiar, and smoky, increased by rubbing or powdering; taste sweetish, acrid, and nauseous. Treated as for the preparation of Resin of Jalap, not less than 10 per cent. of resin should be obtained, of which not more than one-tenth should be soluble in ether.

Chemistry.—Resin, 8-20 per cent.; sugar, gum, starch, albumin, lignin, etc.

Uses, etc.—Jalap is cathartic and diuretic. *Dose.*—10-30 grains in powder.

B.P. Preparations.

Extractum Jalapæ	aqueous and alcoholic; yield about 30 per cent.
Pulvis Jalapæ Compositus	1 part in 3.
,, Scammonii Compositus	3 parts in 8.
Resina Jalapæ.	
Tinctura Jalapæ	1 in 8 of proof spirit.

Jalap Resin is obtained by precipitating a tincture of the root with water; the precipitated resin is washed with hot water and dried at 100°C. By this means it is obtained in dark-brown opaque fragments, translucent at the edges, brittle, breaking with a resinous fracture, readily reduced to a pale-brown powder, sweetish in odour, acrid in the throat, easily soluble in rectified spirit (absence of other than resinous matters), insoluble in oil of turpentine (absence of colophony resin). The powder yields little or nothing to warm water (absence of extractives), and not more than ten per cent. to ether (absence of spurious jalap resin). The resin consists of *convolvulin* (*jalapurgin*, $C_{62}H_{100}O_{32}$) an ether-insoluble resin mixed with a varying quantity of another resin soluble in ether, and traces of extractive matter. Convolvulin, when pure, is colourless, inodorous and tasteless, dissolved by alkalis and not re-precipitated by acids.

Uses, etc.—Same as the root. *Dose.*—2-5 grains.

B.P. Preparation.

Pilula Scammonii Composita.

Note.—Adulterations and Substitutions of Jalap.—*Male Jalap* (Jalap stalks), rom Ipomœa Orizabensis, is often used to adulterate true Jalap, and the resin obtained from it is frequently substituted for Jalap resin. It occurs in irregular, light in colour and weight, rectangular, block-like pieces, the divided portions of a large root, which is often two feet long; or it may be entire, and spindle-shaped, not ovoid like Jalap. The resin, *jalapin* or *orizabin* (8 to 11 per cent.) is colourless, amorphous, translucent and wholly soluble in ether; it is regarded as being identical with scammonin.

Tampico Jalap, another common adulterant, from Ipomœa simulans, is generally smaller than true Jalap, fusiform or finger-like, more shrivelled or corky looking, often having deep wrinkles, and is devoid of transverse scars. It contains a resin, *tampicin* (10-15 per cent.), soluble in ether, and homologous with jalapin.

Wild Jalap, from I. pandurata, containing 1·5 per cent. of an acid resin, is less frequently met with.

BELLADONNÆ RADIX.—Belladonna Root.

—The root of Atropa Belladonna; from plants growing wild or cultivated in Britain, and carefully dried; or imported in a dried state from Germany.

N.O.—Solanaceæ.

Syn.—Deadly nightshade.

Habitat.—Britain.

Characters.—In rough irregularly branched pieces from one to two feet long, and from half an inch to two or more inches thick, generally marked at their upper ends by the hollow bases of the stems which they once bore. The root is covered with a dirty grey or brownish integument, which is easily scraped off by the nail, when the exposed surface presents a whitish appearance. It breaks readily with a short fracture, and the surface is then seen to consist of a thin cortical portion, of a yellowish or pale-brown colour, separated by a dark line from a large central portion of a brownish colour, and marked throughout by scattered darker-coloured dots, but without evident medullary rays. An infusion dropped into the eye dilates the pupil.

Chemistry.—*Atropine* and *hyoscyamine* ·1 to ·6 per cent., combined with malic acid; *belladonnine* and occasionally *atropamine* (both anhydro-atropines); starch and *atrosin*, a red colouring principle. (For method for assay of root see *Pharm. Jour.* [3] xiv., 623.)

Uses, etc.—A powerful sedative and narcotic; dilates the pupil of the eye. *Dose.*—1 grain.

B.P. Preparations.
Atropina.
Linimentum Belladonnæ - - 1 oz. to one and one-half fluid ozs.
*Extractum Belladonnæ Alcoholicum; yield 12-15 per cent.
**From which are prepared* Unguentum Belladonnæ, about 1 in 10; Emplastrum Belladonnæ, 1 in 5.

Note.—The U.S.P. has a fluid extract, and a chloroform of belladonna is included in the B.P.C. formulary. Tinct. Bellad. Æther (Sawyer) is prepared by substituting pure ether for rectified spirit in making the tincture.

ATROPINE ($C_{17}H_{23}NO_3$) is isomeric with hyoscyamine and can be easily obtained from the latter by the action of heat, of acids, and of weak alkalies. For its production the B.P. orders the root to be extracted with alcohol; to the tincture an excess of lime is added, and the filtered solution of the alkaloid so obtained is acidified with sulphuric acid; carbonate of potassium in excess is added to the acid solution, the precipitated alkaloid dissolved in chloroform, the residue, after the evaporation of the chloroform, dissolved in alcohol, and the alcoholic solution, after decolorisation with animal charcoal, allowed to crystallize. The alkaloid so obtained is more or less impure, often containing the uncrystallizable alkaloid belladonnine. When pure it is in the form of colourless acicular crystals without odour, and having a bitter, acrid taste. It melts at 115°C., is soluble in 50 parts of water, 3 parts of alcohol, 16 parts of ether, 2 parts of chloroform, 50 parts of glycerine, and 15 parts of oleic acid. The aqueous solution has an alkaline reaction; powerfully dilates the pupil of the eye, and gives a yellow precipitate with chloride of gold, and in alcoholic solution, a yellow precipitate with perchloride of mercury. It may be distinguished from hyoscyamine by the difference (1) of its melting point; (2) of the melting point of its gold chloride; (3) of its optical properties. By the action of caustic baryta, atropine, or *tropyl-tropine*, is hydrolysed into a mixture of tropic acid ($C_9H_{10}O_3$), which has been prepared synthetically, and tropine ($C_8H_{15}NO$) which latter belongs to the class of alkines, and may be regarded as a pyridine substitution product. Conversely atropine has been obtained by heating together tropic acid and tropine. The sulphate of atropine is official and the most frequently used salt; the salicylate and borate are also used in eye surgery.

Uses, etc.—Rarely if ever given internally.

B.P. Preparations of Atropine.
Unguentum Atropinæ, 18 grains to 1 ounce.
Atropinæ Sulphas.

B.P Preparations of Atropine Sulphate.
Lamellæ Atropinæ, containing $\frac{1}{5000}$ gr. atropine.
Liquor Atropinæ Sulphatis, about 1 gr. in 100 fluid grains.

HOMATROPINE ($C_{16}H_{21}NO_3$) is a frequently-used artificial derivative of atropine. It is obtained by treating tropine (*vide supra*) with amygdalic acid (obtained from amygdalin, the glucoside of almonds). The hydrobromide, HOMATROPINÆ HYDROBROMAS B.P., the form in which it is most frequently used, has been found of great service in ophthalmic surgery since it is said to have a more powerful and at the same time more transient mydriatic action than atropine. *Dose.*—$\frac{1}{80}$-$\frac{1}{20}$ grain. It is used in preparing the non-official Guttæ Homatropinæ and Lamellæ Homatropinæ.

Note.—Scopolia. The rhizomes of Scopolia Carniolica (S. atropoides) and of S. japonica *(Japanese Belladonna)*, contain an alkaloid which, formerly called *scopolamine* is now said to be hyoscine, yielding by decomposition oscine or *scopoline.* Scopolia is but little used in Great Britain, but is a valuable source of the alkaloid.

Mandragora.—The root of Mandragora officinalis (Atropa mandragora, Mandragora vernalis) contains a mydriatic alkaloid *mandragorine* ($C_{17}H_{27}NO_3$) which, in spite of the name and formula which have been assigned to it, is probably identical with atropine.

RHEI RADIX.—Rhubarb Root.—The root, more or less deprived of its bark, sliced and dried, of Rheum palmatum, Rheum officinale, and probably other species. Collected and prepared in China and Thibet.

N.O.—Polygonaceæ.

Habitat.—The Western and North-western provinces of China.

Characters.—In somewhat cylindrical, barrel-shaped, conical plano-convex, or irregularly formed pieces; the outer surface covered with a bright-yellowish brown powder, rounded or somewhat angular, smooth or more or less wrinkled, and marked beneath the powder with reddish-brown or dark rusty-brown lines, intermixed in a yellowish-brown substance, and frequently presenting small scattered star-like spots. Frequently the pieces are bored with a hole which contains the remains of the cord used to suspend them to dry, or the cord has been removed. Hard, compact, fracture uneven, presenting a marbled appearance, and in some cases exhibiting a ring of star-like spots. Odour peculiar and somewhat aromatic; taste bitter, feebly astringent, and when chewed feeling gritty between the teeth.

Varieties.—The geographical source of all official rhubarbs is the same. The roots are dug up in autumn when six years old, cleansed, peeled, and cut into pieces; these are bored through the centre, strung on a string, and dried in the sun. The variety formerly known as "Turkey" rhubarb received its name because it came to us by way of Asiatic Turkey; this has long ceased to be an article of commerce. The variety known as Russian crown or Muscovitic rhubarb, which came to us by way of the Russian frontier town Kiachta, is also no longer obtainable; it consisted of carefully trimmed pieces, with the cortical portion removed and pierced with conical holes. Chinese or East Indian rhubarb comes either directly from China (Kansu, Szechuen, Shensi, etc.) by way of Shanghai or indirectly by way of Singapore and other East Indian ports. In commerce the pieces are classed as "flats" and "rounds;" good pieces are never spongy, decayed, worm-eaten or mouldy. The grittiness, which is characteristic of Asiatic rhubarb, is due to the presence of a large percentage of calcium oxalate in the form of raphides.

Chemistry.—*Chrysophan* ($C_{27}H_{30}O_{14}$), *chrysophanic acid*, *emodin*, *phæoretin*, *erythroretin*, *aporetin*, *rheo-tannic acid*, starch, calcium oxalate. Chrysophan is an orange-yellow, bitter glucoside, breaking up into chrysophanic acid and sugar under the action of dilute acids. It has been questioned whether it pre-exists in the root. Chrysophanic acid ($C_{15}H_{10}O_4$) is tasteless, yellow, crystalline, freely soluble in benzol and chloroform, almost insoluble in water; it is nearly allied chemically to emodin. The chemistry of rhubarb requires further investigation.

Uses, etc.—As tonic, astringent and purgative, rhubarb is one of the commonest and most widely-used drugs in medicine. *Dose.*—5 to 20 grains.

B.P. Preparations.

Extractum Rhei - - -	made with proof spirit; yield 30-35 per cent.
Infusum Rhei - - - -	11 grains to 1 fluid ounce.
Pilula Rhei Composita -	1 part in 4, nearly.
Pulvis Rhei Compositus -	2 parts in 9.
Syrupus Rhei.	
Tinctura Rhei (Compound)	1 in 10 of proof spirit.
Vinum Rhei - - - -	33 grains to 1 fluid ounce.

Preparations other than B.P.—Of these the more important are fluid extract (1 in 1) and pilula (U.S.P.), tincture (P.L.) and elixir (B.P.C.F) Compound extracts of Rhubarb containing various proportions of Ext. Rhei, Aloes and Jalap are included in many of the Continental Pharmacopœias.

Note.—*English Rhubarb* is derived from RH. RHAPONTICUM (a native of Siberia), which is cultivated chiefly at Banbury in Oxfordshire. It occurs in pieces of various sizes and shapes, the cylindrical and flat predominating; all are light, spongy, somewhat friable, and very mucilaginous. Internally they have a marbled appearance, the pinkish streaks being arranged in a parallel or somewhat radial manner. The taste is less bitter. and the grittiness less marked because the amount of raphides present is much less than in the official drug, Its powder is of a bright yellow colour. RH. OFFICINALE has also been cultivated in England.

French and German Rhubarb are derived from RH. RHAPONTICUM, RH. PALMATUM, RH. EMODI, RH. COMPACTUM, RH. UNDULATUM, which are collected in various parts of the Continent.

ADULTERATIONS.—The pieces were formerly rubbed over with turmeric powder to heighten the colour; powdered rhubarb is now used for this purpose. The powder is said to be adulterated with flour and turmeric, and also with the powdered English variety, but this sophistication is rarely practised. Flour is not easy to detect because of the presence of starch in genuine rhubarb; the turmeric may be detected by means of an alcoholic solution of boric acid.

SARSÆ RADIX.—Jamaica Sarsaparilla.—

The dried root of Similax officinalis. It is commonly known as Jamaica Sarsaparilla from having been formerly obtained from Central America by way of that island.

N.O.—Liliaceæ.

Habitat.—Central America.

Characters.—Six or more feet in length, usually bent or folded, and packed together into bundles of about eighteen inches long and four to five inches in diameter, the whole being bound together by a long root of the same drug. Roots more or less furrowed, varying in thickness, but not exceeding that of a goose-quill, greyish-brown to deep reddish-brown, with numerous branched rootlets. Inodorous; taste mucilaginous, and when chewed, feebly bitter and faintly acrid.

Chemistry.—Parillin (smilacin, parillinic acid), a trace of volatile oil, starch and dark extractive matters. Parillin is a glucoside closely resembling saponin, and by the action of dilute acids, is broken up into *parigenin* and a sugar. It has recently been stated that *saponin* and a body called *sarsa-saponin* are also present in sarsaparilla. The acridity of sarsaparilla is a measure of its value; old roots, and those from inferior species, are more or less inert.

Uses, etc.—First introduced as a remedy for venereal diseases, sarsaparilla has been widely used in medicine. Its efficacy is now, however, much doubted, though it is still much used as an ingredient in "blood purifying" medicines.

B.P. Preparations.

Decoctum Sarsæ - - -	2½ ounces to 1 pint.
,, ,, Compositum	2½ ounces to 1 pint.
Extractum Sarsæ Liquidum,	1 pound to 16 fluid ounces.

Note.—Varieties of Sarsaparilla.—Commercially they are classed as *mealy* and *non-mealy* according to the amount and nature of the starch which they contain. To the mealy class belong the *Honduras*, *Guatemala*, *Brazilian* (or *Para*) and *Caraccas* varieties. They are generally swollen, powdery when broken, and have frequently transverse cracks or rings; a weak decoction is coloured by iodine solution. An extract prepared from these will be only partially soluble in water, and will form a turbid solution from the presence of starch. In a transverse section the mealy coat is but little altered by sulphuric acid, while the woody zone becomes purplish or almost black; sometimes the pith also acquires a darkish tint. To the non-mealy class belong the *Jamaica*, *Mexican* (or *Vera Cruz*) and *Guaquil* varieties. These have generally a thin cortical portion which is red or brown in colour, and the transverse section gives, with sulphuric acid, a red or purple throughout. The presence of starch is not so evident in the decoction, and the aqueous extract dissolves clear in water.

SAPONARIA.—Soapwort.—The root of Saponaria officinalis.

N.O.—Caryophyllaceæ.

Habitat.—Central and Southern Europe.

Characters.—About 10 inches long, $\frac{1}{12}$-inch or more in thickness, nearly cylindrical, longitudinally wrinkled, light-brown in colour, internally whitish, with a thick bark, containing numerous small white crystal cells and a pale yellow meditullium; inodorous; taste sweetish and bitter; persistently acrid.

Chemistry.—Saponin ($C_{32}H_{54}O_{18}$) 4 to 5 per cent., mucilage and a little resin. Saponin is split up by dilute acids into sugar and *sapogenin*; its aqueous solution lathers like soap-water.

Uses, etc.—Comparable in its action with Senega or Sarsaparilla.

Note.—Levant Soapwort is Gypsophila Struthium (*N.O.*—Caryophylleæ. *Hab.*—South Europe); it is 12 inches long, about 2 inches thick, longitudinally and transversely wrinkled, pale-brownish externally, internally white, with hard wood, showing numerous medullary rays; its constituents are similar to those of the above.

SYMPHYTUM.—Comfrey.—The root of Symphytum officinale.

N.O.—Boraginaceæ.

Habitat.—Europe ; cultivated in the United States.

Characters.—Spindle-shaped, branched, one inch in diameter and a foot long, externally smooth and blackish, internally white, fleshy and juicy. When dry, wrinkled, of a firm, horny consistence, and of a dark colour inside. Inodorous, and of a mucilaginous taste.

Chemistry.—Mucilage (the most important constituent), tannin, and a trace of starch.

Uses, etc.—An old-fashioned domestic cough remedy. *Dose.*—10-15 grains.

LAPPA.—Burdock.—The root of Lappa officinalis (Arctium Lappa).

N.O.—Compositæ.

Syn.—Radix Bardanæ.

Habitat.—Britain and other parts of Europe.

Characters.—About twelve inches or more long, and about one inch thick ; nearly simple, fusiform, fleshy, longitudinally wrinkled, crowned with a tuft of whitish, soft, hairy leaf-stalks ; grey-brown, internally paler ; bark somewhat thick, the inner part and the soft wood radially striate, the parenchyma often with cavities, lined with snow-white remains of tissue ; odour feeble and unpleasant ; taste mucilaginous, sweetish, and somewhat bitter.

Chemistry.—Inulin, mucilage, sugar, a bitter principle, a little resin, and some tannic acid.

Uses, etc.—Burdock was formerly much used as a popular remedy ; it is now more or less obsolete. Its action is said to be diaphoretic and diuretic. *Dose.*—30-120 grains in decoction. From it are prepared—Extractum Bardanæ (aqueous) and Extractum Lappæ fluidum, U.S.P.

APOCYNUM.—Canadian Hemp.—The root of Apocynum cannabinum.

N.O.—Apocynaceæ.

Habitat.—Canada and United States.

Characters.—Long, cylindrical, somewhat branched, a quarter to one-third of an inch thick, pale brown, longitudinally wrinkled, and transversely fissured ; brittle ; fracture short, white ; the bark thick ; the wood porous, spongy, with delicate medullary rays and a thin pith ; inodorous ; taste bitter and disagreeable..

Chemistry.—*Apocynin*, *apocynein*, extractive, tannic and gallic acids, etc.

Uses, etc.—A powerful emetic and cathartic ; official in the U.S.P. where it is used for making a fluid extract. *Dose*—(as an emetic) 15-30 grains.

Note.—*Dog's-bane*, APOCYNUM ANDROSÆMIFOLIUM, is very similar in appearance to the above, for which it has been not infrequently substituted ; its active principles are said to be practically identical with those of Apocynum cannabinum.

EUPHORBIA.—Spurge.—The root of Euphorbia Ipecacuanha

N.O.—Euphorbiaceæ.

Syn.—American or wild Ipecac.

Habitat.—United States.

Characters.—Several or many headed, branches of the head short or sometimes two inches long, somewhat knotty and marked with stem scars; roots more than 12 inches long, about ⅜-inch thick, nearly cylindrical, somewhat branched, light brown, wrinkled, fracture short; bark somewhat thick, white internally; wood yellowish, spongy; inodorous, sweetish, somewhat bitter, slightly acrid.

Chemistry.—Tannin, resins (probably the active constituents), starch and *euphorbon.*

Uses, etc.—Cathartic and emetic, formerly official in U.S.P. *Dose.*—5-20 grains.

Note.—EUPHORBIA COROLLATA, the large flowering spurge, has roots similar to the above, with similar medicinal properties; like the latter it was formerly official in the U.S. Very numerous other species of Euphorbia are employed medicinally in the countries where they are indigenous, *e.g.*, E. PROSTRATA, E. MACULATA, E. HUMISTRATA, E. HYPERICIFOLIA, etc.

ANGELICA.—Angelica Root—The root of Archangelica (Angelica) officinalis.

N.O.—Umbelliferæ.

Syn.—Garden angelica.

Habitat.—Most places in the northern parts of Europe.

Characters.—Wrinkled, 2-4 inches long and one inch or more in diameter, and beset with long descending radicles; greyish-brown externally, white and spongy internally; fracture starchy, exhibiting resinous spots, taste warm and bitterish; odour strong and fragrant; taste sweetish, pungent and bitter.

Chemistry.—Volatile oil (1 per cent.), resin, valerianic acid, *angelic acid* ($C_5H_8O_2$), *angelicin*, sugar, bitter principle, etc.

Uses, etc.—Formerly much used as a specific for typhoid; has tonic, stimulant and diaphoretic properties, etc. *Dose.*—10-30 grains in powder.

Note.—ANGELICA ATROPURPUREA (*American Angelica*) has a root similar in appearance to the above, and with nearly allied constitution and properties.

STILLINGIA.—Queen's Root.—The root of Stillingia sylvatica (Sapium sylvaticum.)

N.O.—Euphorbiaceæ.

Syn.—Silver leaf.

Habitat.—United States of America.

Characters.—About twelve inches long and nearly two inches thick, sub-cylindrical, slightly branched, compact, wrinkled, tough, greyish-brown; breaking with a fibrous fracture, showing a thick bark and porous wood, the inner bark and medullary rays with numerous brown resin cells; odour peculiar, unpleasant; taste bitter, acrid, pungent.

Chemistry.—The pungency is due to a resinous constituent, which is soluble in alcohol. Starch and tannic acid are also present.

Uses, etc.—Said to be useful in syphilitic diseases; is emetic and alterative. *Dose.*—15-30 grains

Preparations.—Extractum Stillingiæ fluidum, U.S.P., Mistura Stillingiæ composita, Syrupus Stillingiæ compositus, N.F.

Note.—STILLINGIA SEBIFERA, indigenous to China, has a fruit containing a fat which is known as *Chinese tallow;* the latter consists of a mixture of palmitin and stearin, and melts at 44·5°C.

PETROSELINUM.—Parsley.—The root of Petroselinum sativum.

N.O.—Umbelliferæ.

Habitat.—South Europe (and cultivated).

Characters.—Conical, about six inches long and about half an inch thick; light-brown yellow; annulate above, wrinkled below with transverse ridges; faintly aromatic, sweetish; fracture short; bark thick, resinous, dotted and like the medullary rays, white; wood light yellow, porous.

Chemistry.—Starch, mucilage, sugar, volatile oil, and *apiin* ($C_{24}H_{28}O_{13}$). The latter is white, inodorous, tasteless and soluble in boiling water.

Uses, etc.—As a carminative, tonic and diuretic. *Dose.*—½-1 dram in infusion.

Note.—Other less important drugs of the order Umbelliferæ are the roots of—

Levisticum officinale *(Lovage)*, head 2-4 inches long and 1-1½ inches thick; divided below into a few sub-cylindrical branches; brown or red-brown; fracture short, spongy; aromatic, sweetish, pungent and bitter. Lovage contains volatile oil, angelic acid, bitter extractive, resins, etc.

Laserptium latifolium (*White Gentian*), several headed, somewhat conical, annulate above, branched below, deeply wrinkled; brown corky layer removed; greyish-white, aromatic, bitter; fracture short, white; bark thick, with numerous orange-coloured resin-ducts; wood finely porous; contains volatile oil and bitter principle.

Pimpinella Saxafraga (*Pimpernel*), several-headed, branches of the head short. terminated by the hollow stem base; fusiform, about eight inches long, annulate above, tuberculate below; externally yellowish-brown; aromatic, sweetish, pungent; bark thick, radiate; wood yellowish, porous, radiate; contains volatile oil, acid resin and *pimpinellin*,

Sanicula Marilandica (*sanicle, black snake root, pool-root*) contains resin and volatile oil, and has been used with alleged success in intermittent fever and in chorea. *Dose.*—10-60 grains.

PHYTOLACCÆ RADIX.—Poke Root.—The root of Phytolacca decandra, collected in August.

N.O.—Phytolaccaceæ.

Syn.—Garget.

Habitat.—N. America (naturalized in Europe).

Characters.—Large, conical, branched and fleshy; mostly in transverse or longitudinal slices, wrinkled, grey, hard; fracture fibrous, the wood-bundles in several distinct, concentric circles; inodorous, sweetish and acrid.

Chemistry.—Starch, tannin, resin, *phytolaccic acid*, *phytolaccine* (alkaloid).

Uses, etc.—In rheumatism and skin diseases. *Dose* (as an emetic):—10-30 grains.

RUBIA.—Madder.—The root of Rubia tinctorum.

N.O.—Rubiaceæ.

Habitat.—Levant and S. Europe.

Characters.—Rhizome cylindrical, long, one-fifth of an inch thick, with distant nodes; roots about one-eighth of an inch thick, dark red, deeply wrinkled with foliaceous cork; thin brown inner bark, spongy red wood and irregular medullary rays; fracture short; taste sweetish, acrid, astringent; odour feeble. Usually found in the form of powder.

Chemistry.—*Rubian*, *rubhydran*, *ruberythric acid*, *alizarin*, purpurin, sugar, tannin, etc.

Alizarin ($C_{14}H_8O_4$) is the most important derivative of the root, and until this was synthetically produced from anthracene, madder was extensively used for dyeing purposes. Alizarin is an orange-red, crystalline, sublimable body, soluble in boiling water, alcohol and ether, and forming purple or red-coloured compounds with alkalies. It is formed by the decomposition of ruberythric acid which is present in fresh madder, and is hence found in the dried root. Chemically it is dioxyanthraquinone.

Uses, etc.—As a dye; rarely as a medicine.

HEUCHERA—Alum Root.—The root of Heuchera Americana.

N.O.—Saxifragaceæ.

Habitat.—United States.

Characters.—About six inches long, half an inch thick, several-headed, somewhat contorted, branched, wrinkled, tuberculate, purplish-brown; internally reddish or brownish; bark thin; inodorous; highly astringent and bitter.

Chemistry.—18-20 per cent. of tannin.

Uses, etc.—As an astringent. *Dose.*—15-30 grains.

RUMEX CRISPUS.—Yellow Dock.—The root of Rumex crispus and other species of Rumex.

N.O.—Polygonaceæ.

Syn—Radix lapathi.

Habitat.—Europe.

Characters.—From eight to twelve inches long, about half an inch thick, somewhat fusiform, fleshy, nearly simple, annulate above, deeply wrinkled below, externally rusty-brown, internally whitish, with fine, straight, interrupted reddish medullary rays, and a rather thick bark; astringent, bitter taste; little or no smell.

Chemistry.—Tannic acid and *rumicin*, which is said to be identical with chrysophanic acid.

Uses, etc.—As an astringent and tonic; in large doses laxative. *Dose.*—15-60 grains. The U.S.P. includes a fluid extract.

METHYSTICUM.—Kava-kava.—The dried root of Piper methysticum.

N.O.—Piperaceæ.

Habitat.—South Sea Islands.

Characters.—Root large, in commerce usually cut longitudinally and transversely into irregular pieces; light and often more or less hollow in the interior; externally blackish-gray; fracture farinaceous and somewhat splintery; bark thin; meditullium porous, with irregularly twisted wood bundles radiating near the surface. Odour slight, agreeably aromatic; taste pungent and somewhat benumbing.

Chemistry.—Volatile oil, acrid resin, *kavahin* (crystalline, soluble in water, tasteless), *methysticine* (crystalline, insoluble in water, tasteless), gum, starch, etc.

Uses, etc.—Said to be much used by the Polynesians as a remedy for gonorrhœa; they also brew from it the beverage *kava*, which has stimulant, diuretic and diaphoretic properties. *Dose.*—15-60 grains. A non-official alcoholic extract and a liquid extract are prepared from it; the former has been used as a local anæsthetic.

ABRI RADIX.—Indian Liquorice.—The root of Abrus precatorius.

N.O.—Leguminosæ.

Syn.—Gunja, goontch.

Habitat.—India.

Characters.—Long and woody, about half an inch or less in diameter; externally pale reddish-brown; internally reddish. It has a thin bark, peculiar disagreeable odour, and a bitterish acrid flavour, leaving a faintly sweet after-taste.

Chemistry.—Contains sugar and probably glycyrrhizin.

Uses, etc.—Official in India; has demulcent and emollient properties.

BAPTISIA.—Wild Indigo.—The root of Baptisia tinctoria.

N.O.—Leguminosæ.

Habitat.—United States of America.

Characters.—Consists of a knotty head, two to three inches broad, and below divided into branches, half an inch in diameter; of a dark-brown colour, slight peculiar odour, and a nauseous, bitter, somewhat acrid taste.

Chemistry.—*Baptisin* (a bitter glucoside, insoluble in water), *baptin* (a glucoside, crystalline, soluble in water), *baptitoxine* (a poisonous alkaloid), resin, starch, etc.

Uses, etc.—As emetic, stimulant and cathartic, usually given in decoction. *Dose.*—5-15 grains.

HYDRANGEA.—Hydrangea.—The root of Hydrangea arborescens.

N.O.—Saxifragaceæ.

Habitat.—United States of America.

Characters.—Head, irregular, knotty; roots of variable length and thickness, bent and branched; externally pale-grey; tough; fracture splintery; internally white; bark thin and readily separated from the wood; inodorous; taste sweetish and somewhat pungent.

Chemistry.—Resin, gum, sugar, starch and a glucoside.

Uses, etc.—Diuretic. *Dose.*—30-60 grains in powder.

STATICE.—Marsh Rosemary.—The root of Statice Limonium. *var* caroliniana.

N.O.—Plumbagineæ.

Habitat.—Europe and America.

Syn.—Ink root, sea-lavender.

Characters.—Several headed, one to two feet long and one or more inches thick; closely annulate above; branches longitudinally wrinkled; root purplish-brown externally, paler internally; breaks with short fracture, showing thick bark and meditullium with narrow pale-yellow wood-wedges; odourless; taste astringent and slightly bitter.

Chemistry.—14-18 per cent. of tannin.

Uses, etc.—As an astringent. *Dose.*—8-30 grains.

Note.—Bayacura used in Brazil is the root of STATICE BRASILIENSIS; it contains tannin and also, it is said, a crystalline alkaloid *baycurine*. Other species of statice are used for their astringent properties in the various countries in which they are indigenous.

CEANOTHUS—Red Root.—The root of Ceanothus Americanus.

N.O.—Rhamnaceæ.

Habitat.—North America.

Syn.—New Jersey Tea.

Characters.—Head simple or branched, knotty-tuberculate; root twelve inches long and two-fifths to one inch thick, contorted, branched, brown, finely wrinkled, fracture granular; wood tough, pale brown-red with fine rays; inodorous; taste bitter and astringent.

Chemistry.—Tannin, starch, etc.

Uses, etc.—Astringent, tonic.—*Dose.*—10-30 grains.

ARTEMISIÆ RADIX.—Mugwort Root.—The root of Artemisia vulgaris.

N.O.—Compositæ.

Habitat.—Asia, Europe and Africa.

Characters.—About eight inches in length, woody, beset with numerous thin and tough radicles; radicles two to four inches long and about one-twelfth inch thick; light brown externally; internally whitish; with an angular wood and thick bark showing five or six resin cells; taste sweetish, acrid.

Chemistry.—Volatile oil, acrid resin and tannin.

Uses, etc.—At one time much used as a remedy for epilepsy; has stimulant and tonic properties. *Dose.*—15-60 grains in infusion.

CAHINCA.—Cahinca Root.—The root of Chiococca racemosa

N.O.—Rubiaceæ.

Syn.—Radix cainanæ.

Habitat.—South America and West Indies.

Characters.—Woody, three to six inches long, about one-twelfth to one-quarter inch thick, more or less bent, externally blackish or greyish-brown, finely wrinkled longitudinally with narrow, transverse, corky ridges and with a fine brown bark of resinous lustre internally, and a whitish wood. Taste of bark nauseous, bitter, and acrid.

Chemistry.—Tannin and *cahincin*, which is white, crystalline, soluble in 600 parts of cold water.

Uses, etc.—Diuretic, now little used. *Dose.*—15-20 grains.

IMPERATORIA.—Masterwort.—The root of Peucedanum ostruthium.

N.O.—Umbelliferæ.

Habitat.—South and Central Europe.

Characters.—Somewhat conical, about two inches long and nearly four-fifths inch thick, flattish, finely annulate above, wrinkled and tuberculate; brown-grey, internally whitish with numerous resin dots; odour balsamic; taste pungent and bitter; bark thin, wood-bundles small, inclosing a large pith.

Chemistry.—Volatile oil, *imperatorin* (peucedanin), *ostruthin.* Peucedanin is crystalline, pungently acrid and insoluble in water.

Uses, etc.—Has stimulant and tonic properties but is now little used. *Dose.*—15-30 grains.

SALEP.—Salep.—The unbranched tubers of different species of Orchis and allied genera, as O. mascula, O. militaris, O. morio, O. ustulata, Anacamptis pyramidalis, Platanthera bifolia, etc.

N.O.—Orchidaceæ.

Syn.—Radix Satyrii.

Habitat.—Persia and Southern and Central Europe.

Characters.—Oriental salep is one to two inches long and usually dark coloured; European salep is always smaller. It is globular, pyriform, ovate or oblong in shape; somewhat flattened or wrinkled, with the scar of the terminal bud at the apex; of a pale-brownish yellow colour, somewhat translucent, of a horny texture, hard, inodorous, and of an insipid, very mucilaginous taste. Its powder is of a yellowish colour.

Chemistry.—Starch (27 per cent.); mucilage (48 per cent.); sugar (1 per cent.); nitrogenous substances (5 per cent.); cellulose (2·5 per cent.); ash (2 per cent.) The mucilage is not extracted by cold water.

Uses, etc.—Salep is nutritive and demulcent and on account of its confining effect upon the bowels has been recommended as an article of diet for infants and invalids suffering from chronic diarrhœa. Mixed with fifty parts of boiling water, one part of salep forms a jelly. The German Pharmacopœia has a mucilage of Salep.

CHINÆ RADIX.—China Root.—The root of Smilax China.

N.O.—Smilaceæ.

Habitat.—China, Japan, E. India.

Characters.—Irregularly cylindrical tubers, from four to six inches in length and from one to two inches in thickness; usually somewhat flattened and producing short knobby branches; covered with a rusty-coloured, somewhat shiny bark, which may be either smooth or wrinkled; internally of a pale fawn colour, mealy, showing small resin cells; inodorous and insipid.

Chemistry.—Probably similar to that of sarsaparilla.

Uses, etc.—Obsolete in Europe; in China and India a remedy for syphilitic diseases.

TODDALIÆ RADIX.—Toddalia.—The root of Toddalia aculeata.

N.O.—Rutaceæ.

Syn.—Lopez root.

Habitat.—The Madras Peninsula.

Characters.—A solid heavy branching root, attaining some inches in diameter, having a suberous bitter cortical portion and yellow tasteless meditullium. Bark velvety, and of a dull yellow colour; taste bitter, pungent and aromatic.

Chemistry.—A little essential oil, little or no tannic acid, and much resin.

Uses, etc.—Official in the Indian Pharmacopœia as a stimulant tonic.

TINOSPORÆ RADIX et CAULES.—Gulancha.—The root and stems of Tinospora cordifolia.

N.O.—Menispermaceæ.

Habitat.—Tropical India.

Characters.—Dried transverse segments of a cylindrical woody stem varying in diameter from a quarter to two inches, and from one-half to two inches in length; of a shrunken appearance, and covered with a smooth translucent shrivelled bark, which becomes dull and rugose with age. Many of the pieces are marked on their surface with warty prominences. A transverse section shows a radiate structure, with conspicuous medullary rays, traversing a very porous tissue. It is inodorous, but has a very bitter taste. Its infusion is not blackened by a persalt of iron.

Chemistry.—Its activity is due to the presence of a bitter principle of unknown nature.

Uses, etc.—Gulancha has a reputation in India (where it is official) for being tonic and diuretic.

ARUM.—Cuckoo-pint.—The tuberous root of Arum maculatum.

N.O.—Aroideæ.

Habitat.—Indigenous.

Characters.—Oblong in shape, about the size of a pigeon's egg; brownish externally, white within, and, when fresh, fleshy and yielding a milky juice, which is almost insipid to the taste at first, but soon produces a burning and pricking sensation which lasts for some time. This acridity is lost during the process of drying.

Chemistry.—Starch, sugar, gum, resin, albumin, fat and extractive matter. There is also present a volatile acrid principle, which is soluble in ether. Saponin has also been found, and it is supposed that a volatile alkaloid is present in the tuber.

Uses, etc.—The source of the so-called "Portland arrowroot," now obsolete. In the fresh state the tubers act as an irritant when applied externally.

Note.—The American Arum, ARUM TRIPHYLLUM (*Dragon root, Indian turnip*), has similar characters and properties to the above.

3. RHIZOMES.—RHIZOMATA.

General Morphology of Rhizomes.—The rhizome is an oblique or prostrate stem growing perennially on or under the ground, and producing aërial shoots either at the apex from terminal buds or laterally from axillary buds. The roots or rootlets arise on the under surface normally at the points from which the aërial stems are given off—these points being termed the *nodes*. Rhizomes are frequently thickened by the presence of contained food material, *e.g.*, ginger, etc., and in such cases each year's growth is usually marked by scars left after the fall of the aërial stems or branches, at the end of the active period of growth. Rhizomes are *monopodic* or *sympodic* according to whether they grow by means of a terminal or an axillary bud.

A *corm* is a subterranean fleshy stem of rounded or depressed figure, some buds of which produce fresh corms, whilst others put up aërial stems which produce leaves and flowers. Corms are either *naked* (*e.g.*, cyclamen) or *tunicated* (*e.g.*, crocus, colchicum).

A *bulb* consists of an underground stem reduced to a flat plate and giving off aërial growths and fresh bulbs from its upper surface and rootlets from below. The aërial bud is surrounded by fleshy scale-like leaves which contain the food material which in the corm resides in the cauline or stem portion (*e.g.*, squill, tulip). The bulb is said to be *scaly* when the fleshy leaves are small, thick and imbricate, whilst in the case of the *tunicated* bulb the leaves are of varying thickness and form concentric layers, the outer ones being thin and papery.

General Histology of the Rhizome.—The histological characters of the rhizome are similar to those of the stem. In the dicotyledons an external jacket of flattened cork cells (replacing the epidermis of the young rhizome) forms the outer layer *(periderm)* of the bark. Internally to this a layer of parenchymatous tissue encloses the *bast* or *phloëm*, and separating the latter from the *wood* or *xylem*, is the cylinder of *cambium* cells, by the activity of which the increase in thickness of the rhizome takes place. The wood or xylem is arranged usually in the form of wedges, alternating with the *medullary rays* and enclosing a central cylinder of *pith*. The so-called bark of rhizomes and stems is commonly spoken of as consisting of an inner and an outer portion. The *inner bark*, *liber* or *endophlœum*, is identical with the bast or phloëm, whilst the *outer bark* consists of two layers, an inner parenchymatous *mesophlœum* and an outer *epiphlœum* consisting of cork cells and synonymous with the periderm.

In monocotyledons the arrangement of the tissues differs entirely from that described above; the rhizome consists of parenchymatous tissue covered externally by an epidermal or cortical layer, and enclosing an internal cylinder through which fibrovascular bundles are irregularly scattered. Hence there is no separable bark and the growth in circumference of the normal monocotyledonous stem or rhizome is limited by the extensibility of the outer rind.

General Chemical Characters of Rhizomes.—These are very similar to those described under "Roots."—(*See* p. 23.)

CIMICIFUGÆ RHIZOMA.—Cimicifuga.—

The dried rhizome and rootlets of Cimicifuga racemosa (Actæa racemosa).

N.O.—Ranunculaceæ.

Syn.—Actææ radix, Black snake root, Black cohosh.

Habitat.—United States and Canada.

Characters.—The rhizome is from about two to six inches long, from half an inch to an inch thick, hard, somewhat flattened-cylindrical in form, having on its upper surface the remains of several aerial stems, and below numerous small wiry, brittle, branched rootlets, which in commercial specimens are more or less broken off. Both rhizome and rootlets are brownish-black, almost odourless, and of a bitter, slightly acrid taste. Their fracture is close, that of the rootlets presenting a thick bark, and a central axis with from three to five, usually four, converging woody wedges, so as to assume a triangular, cross-like, or stellate appearance. An infusion is blackened by a persalt of iron.

Chemistry.—A crystalline neutral principle soluble in alcohol and in chloroform is said to have been isolated and there are also present starch, astringent acids (which cause a blackness with ferric chloride solution), resin, and a little volatile oil.

Uses, etc.—Has found frequent and successful use in various nervous diseases, rheumatism, etc.; is said to a have a well-marked action on the uterus. *Dose* (in powder)—20 grains.

B.P. Preparations.

Extractum Cimicifugæ Liquidum,	1 in 1 of rectified spirit.
Tinctura Cimicifugæ - - - -	1 in 8 of proof spirit.

Preparations other than B.P.—Liquid Extract U.S.P., Tincture U.S.P., Tinctura Actææ racemosæ (Squire.)

Note.—ACTÆA SPICATA (*Baneberry*), a native of Central Asia and Europe, has a rhizome and rootlets closely resembling the above except in being shorter, thinner and of a blackish-grey colour. The constitutents also are similar to those of Cimicifuga. This drug is used in domestic medicine and has an emeto-cathartic action.

HELLEBORUS.—Black Hellebore.—The dried rhizome and rootlets of Helleborus niger.

N.O.—Ranunculaceæ.

Syn.—Christmas Rose.

Habitat.—Europe.

Characters.—Rhizome irregularly twisted, one or more inches long, one quarter to half-an-inch thick, marked longitudinally and transversely; rootlets long and brittle; black externally, whitish internally. Meditullium of rootlets, homogeneous. No marked odour, bitter taste. A solution of ferric chloride has no action on a cold aqueous infusion.

Chemistry.—*Helleborin* ($C_{36}H_{42}O_6$) and *helleborein* ($C_{26}H_{44}O_{15}$), two poisonous glucosides; helleborin is insoluble, helleborein soluble in cold water; resin, fat, and starch are also present, but tannin is absent.

Uses, etc.—Said to have been used as a purgative since B.C. 1400. *Dose.*—5-20 grains in powder. An extract (alcoholic) was formerly official in the U.S.P. and a tincture (1 in 8 of proof spirit) is used on the continent.

Note.—Helleborus Viridis *(Green hellebore)* is not to be confounded with Veratrum Viride which is also sometimes known as green hellebore. It has a rhizome much resembling that of the preceding, but it is of smaller dimensions, and it contains more helleborin than the black variety.

HYDRASTIS RHIZOMA.—Hydrastis Rhizome.—The rhizome and rootlets of Hydrastis Canadensis.

N.O.—Ranunculaceæ.

Syn.—Yellow root, Golden seal, Indian turmeric.

Habitat.—Canada and the United States.

Characters.—Rhizome about an inch and a half long and a quarter of an inch thick; oblique, with short branches, somewhat annulate and longitudinally wrinkled; externally yellowish grey; fracture short, waxy, bright reddish-yellow; thickish bark, about ten narrow wood wedges, broad medullary rays and large pith. Rootlets thin, brittle, with a thick, yellow bark and subquadrangular woody centre. Odour slight; taste bitter.

Chemistry.—There are present two alkaloids viz. :—*berberine* ($C_{20}H_{17}NO_4$) insoluble in chloroform and forming yellow salts, and *hydrastine* ($C_{21}H_{21}NO_6$) soluble in chloroform, forming white salts and yielding on oxidation opianic acid and *hydrastinine.* The presence of two other alkaloids (*xantho-puccine* and *canadine*) has been asserted.

Uses, etc.—Tonic, astringent, stomachic; formerly much used by the American aborigines.

B.P. Preparations.

Extractum Hydrastis Liquidum, 1 in 1.
Tinctura Hydrastis - - - - 1 in 10 of proof spirit.

Note.—NON-OFFICIAL PREPARATIONS.—*Hydrastine* was the name given to an eclectic remedy prepared by precipitating an alcoholic extract of the drug with water; it consisted chiefly of hydrochlorate of berberine. The alkaloid hydrastine and its hydrochlorate, as also hydrastinine, the oxidation product, are used in medicine.

COPTIDIS RHIZOMA.—Coptis Rhizome.—The dried rhizome of Coptis Teeta, imported into Bengal from Assam.

N.O.—Ranunculaceæ.

Syn.—Mahmira, Tita.

Habitat.—Mishmi Mountains, East of Assam.

Characters.—A woody rhizome of the thickness of a small goose quill and of from one to two inches in length, often contracted at one extremity into a short woody stem. The surface is usually rough, irregular, more or less annulated, and marked with the remains of rootlets in the shape of short shiny points. Externally of a yellowish-brown colour; internally much brighter, frequently of a golden yellow colour, exhibiting in fracture a radiating structure.

Chemistry.—Berberine (8 per cent.) and a yellow bitter principle; no tannin is present.

Uses, etc.—Official in Pharmacopœia of India as a pure, bitter tonic

Note.—The Coptis (*Gold thread*) of the United States is derived from COPTIS TRIFOLIA; it contains berberine and also it is said, *coptine*, a white alkaloid.

PODOPHYLLI RHIZOMA—Podophyllum Rhizome.—The dried rhizome and rootlets of Podophyllum peltatum.

N.O.—Berberideæ.

Syn.—Mandrake, May Apple, Podophylli Radix.

Habitat.—North America.

Characters.—In pieces of variable length, and from about one-fifth to one-third of an inch thick; flattened cylindrical, presenting at varying intervals large irregular tuberosities which are marked above by a depressed circular scar, and giving off below a variable number of very brittle brownish rootlets, or if these are broken off, presenting a corresponding number of whitish scars; dark reddish brown or reddish yellow; smooth or somewhat wrinkled, breaking with a short fracture, internally whitish and mealy. Odour faintly narcotic ; taste bitterish, acrid and nauseous.

Chemistry.—Resin 4-5 per cent., sugar, starch, fat, etc. The resin consists of (1) *podophyllotoxin*, soluble in chloroform, alcohol and hot water ; (2) *podophyllo-quercetin*, soluble in chloroform and alcohol, insoluble in water ; (3) *podophyllic acid*, insoluble in ether, soluble in alcohol. Podophyllotoxin, which is said to be the valuable constituent, is separable into *picropodophyllin* and *picropodophyllic acid* by the action of dilute acids.

Uses, etc.—A powerful hepatic and intestinal stimulant. *Dose.*—5-15 grains in powder.

B.P. Preparations.

Resina Podophylli.
Tinctura Podophylli, 1 of resin in 60 of rectified spirit.

Resina Podophylli.—The resin is prepared by making a tincture of the rhizome, removing from this the greater part of the spirit by distillation, and pouring the remaining liquor into three times its volume of water ; by this means the resin is precipitated and may be collected and dried. The use of hydrochloric acid ordered by the '67 B.P. has now been abandoned, since it was supposed to cause the decomposition of the podophyllotoxin. (*See Chemistry of Rhizome above.*) The resin is not infrequently adulterated either with the powdered rhizome or with mineral matter—the presence of the latter being in some cases no doubt due to the use of such salts as alum in the precipitation. The colour of the resin varies considerably, and cannot be regarded as being a criterion of its quality. The resin should not, however, give more than about 1 per cent. of ash on incineration, and ammonia water should dissolve it entirely. An ammoniated tincture of the resin is recommended on account of its miscibility with water.

Note.—Indian Podophyllum is the rhizome and rootlets of Podophyllum Emodi. It contains about double the amount of resin found in the official drug, but the activity of this is stated to be but half that of the official product.

CAULOPHYLLUM.—Blue Cohosh.—The rhizome and rootlets of Caulophyllum thalictroides.

N.O.—Berberideæ.

Habitat.—United States and Canada.

Characters.—Rhizome four inches long, one-quarter to two-fifths of an inch thick, bent, marked above with stem scars and knotty branches, and having below numerous long, thin, rough, and matted rootlets.

Chemistry.—A glucoside *leontin*, resin, tannin and fat are present.

Uses, etc.—Antispasmodic, diuretic, etc. *Dose.*—15-30 grains : official in the U.S.P.

SANGUINARIÆ RHIZOMA.—Blood Root.—The rhizome of Sanguinaria Canadensis, collected in autumn.

N.O.—Papaveraceæ.

Syn.—Indian paint.

Habitat.—United States of America and Canada.

Characters.—About two inches long and two-fifths of an inch thick, horizontal, cylindrical, somewhat branched, faintly annulate, wrinkled, reddish brown; fracture short, somewhat waxy, whitish, with numerous small red resin cells, of a nearly uniform, brownish red colour; bark thin; odour slight; taste persistently bitter and acrid.

Chemistry.—The root contains four alkaloids, viz:—*chelerythrine* ($C_{21}H_{19}NO_4$), *sanguinarine*, *γ-homochelidonine* and *protopine*; the first-named is present in greatest quantity, and the two latter are said to be identical with two alkaloids found in Chelidonium majus. Starch, citric and malic acids are also present.

Uses, etc.—Alterative, expectorant, emetic. *Dose* (as emetic)—10 grains. The 1880 U.S.P. includes a vinegar of sanguinaria, and a non-official tincture finds occasional use.

VALERIANÆ RHIZOMA.—Valerian Rhizome.

—The dried rhizome and rootlets of Valeriana officinalis; collected in autumn from plants growing wild or cultivated in Britain.

N.O.—Valerianaceæ.

Syn.—Valerianæ radix.

Habitat.—Britain.

Characters.—A short erect rhizome, entire or sliced, dark yellowish-brown externally, and giving off numerous slender, brittle, shrivelled rootlets, three or four inches long, of the same colour as the rhizome; rhizome and rootlets whitish internally. Odour developed in the process of drying, strong, peculiar, and disagreeable; taste unpleasant, camphoraceous and slightly bitter. Yields volatile oil and valerianic acid when distilled with water.

This root somewhat resembles Serpentary root, but may be distinguished by its odour, and by the rootlets being thicker, shorter, and less brittle. The rootlets of Veratrum album and Veratrum viride are paler in colour, larger and more shrivelled.

Chemistry.—The valuable constituent is the volatile oil which contains pinene, borneol and the formic, acetic and *valerianic* esters of the latter. Valerianic acid is not a natural constituent of the volatile oil, but results from the decomposition of the above-named ester, the relative proportions of the acid and the volatile oil varying according to the age of the rhizome. Resinous extractive, sugar and malic acid are also present.

Uses, etc.—A nervous stimulant and antispasmodic. *Dose.*—10-30 grains in powder.

B.P. Preparations.

Infusum Valerianæ - - - -	220 grains to 1 pint.
Tinctura Valerianæ - - - -	1 in 8 of proof spirit.
,, ,, Ammoniata -	1 in 8 of aromatic spirit of ammonia.

Preparations other than B.P.—An etherial tincture and the volatile oil are official in some of the Continental Pharmacopœias, and a distilled water and syrup in the French Codex. Valerianic acid is not prepared from the root, but synthetically from amyl alcohol.

Note.—Mexican Valerian, from V. officinalis, growing in Mexico, contains more volatile oil than the European root. *Japanese Valerian*, or *Kesso* root, is said to be obtained from a Japanese variety of V. officinalis. *Indian Valerian*, the rhizome of NARDOSTACHYS (VALERIANA) JATAMANSI, was formerly much used under the name of *spikenard*. The roots of V. PHU. and V. DIOICA have similar properties to those of the official drug, and are said to have been found as admixtures of it.

ARNICÆ RHIZOMA.—Arnica Rhizome.

The dried rhizome and rootlets of Arnica montana.

N.O.—Compositæ.

Syn.—Arnicæ Radix.

Habitat.—Middle and Southern Europe.

Characters.—Rhizome cylindrical, dark brown, from one to two inches or more in length, and from about a sixth to a quarter of an inch in diameter, contorted, rough from the scars of fallen leaves, some remains of which are usually to be found at its upper end, and giving off from its under surface numerous dark brown filiform wiry rootlets. Odour peculiar and somewhat aromatic ; taste acrid and bitterish.

Chemistry.—Volatile oil ($\frac{1}{2}$-1 per cent.), resin, inulin (10 per cent.) and *arnicin* ($C_{12}H_{22}O_2$). The volatile oil consists of three volatile esters. Arnicin, which is said to be the active principle, is a yellow crystalline acrid substance, soluble in alcohol and ether ; it has not yet been shown to what class of bodies it belongs chemically.

Uses, etc.—Much esteemed domestically as a vulnerary application ; internally stimulant and irritant. *Dose.*—5-30 grains.

B.P. Preparation.

Tinctura Arnicæ - - - - 1 in 20 of rectified spirit.

Note.—The U.S.P. includes a fluid extract 1 in 1.

GELSEMIUM.—Yellow Jasmine.—The dried rhizome and rootlets of Gelsemium nitidum (Gelsemium sempervirens).

N.O.—Loganiaceæ.

Habitat.—United States of America.

Characters.—Nearly cylindrical, from half an inch to six inches or more in length, and commonly from a quarter to three-quarters of an inch in diameter, with small rootlets attached to, or mixed with, the larger pieces ; light yellowish-brown externally, and marked longitudinally by dark purplish lines ; fracture splintery ; bark thin, presenting silky fibres in its liber, and closely attached to a pale yellow, porous, woody axis, with evident medullary rays, and with or without pith. Odour somewhat narcotic and aromatic ; taste bitter.

Chemistry.—*Gelsemine* (crystalline alkaloid), *gelseminine* (amorphous alkaloid), *gelseminic acid*, volatile oil, resin and starch.

Gelsemine is said to be little if at all poisonous, and the activity of the drug is therefore ascribed to the second alkaloid, gelseminine. Gelseminic acid (regarded by some as identical with æsculin) is colourless, inodorous, crystalline, and produces a blue fluorescence in alkaline solutions.

Uses, etc.—A powerful spinal sedative. *Dose.*—5-30 grains.

B.P. Preparations.

Extractum Gelsemii Alcoholicum, yield about 12 per cent.
Tinctura Gelsemii - - - - 1 in 8 of proof spirit.

SPIGELIA—Indian Pink.—The rhizome and rootlets of Spigelia Marilandica.

N.O.—Loganiaceæ.

Habitat.—United States of America.

Characters.—Rhizome two inches or more long, about one-eighth of an inch thick, horizontal, bent, somewhat branched on the upper side with cup-shaped scars; on the lower with numerous thin, brittle rootlets, about four inches long, dark purplish-brown; somewhat aromatic; sweetish and bitter taste. The stem is simple erect and quadrangular. Leaves sessile ovate, lanceolate-acute, decussate. Flowers sessile, in unilateral spikes.

Chemistry.—Fixed and volatile oil, a little resin, bitter extractive, with mucilaginous and saccharine matter and some salts. *Spigeline,* a liquid volatile alkaloid, is also said to be present.

Uses, etc,—Anthelmintic, etc. *Dose.*—15-60 grains. Official in U.S.P. for the production of a fluid extract. Spigelia is a frequent ingredient of worm teas and similar remedies.

Note.—Spigelia should not be confounded with the underground portion of PHLOX CAROLINA (also known as *Caroline Pink*), the rootlets of which are brownish-yellow, rather coarse, straight, and contain a straw-coloured wood underneath a readily-removable bark.

SERPENTARIÆ RHIZOMA—Serpentary Rhizome.—The dried rhizome and rootlets of Aristolochia Serpentaria, or of Aristolochia reticulata.

N.O.—Aristolochiaceæ.

Syn.—Serpentariæ Radix, Virginian Snakeroot.

Habitat.—Southern parts of North America.

Characters.—Rhizome twisted, about one inch long and one-eighth of an inch in diameter, marked above by the remains of former stems, and giving off below an interlacing tuft of numerous slender branched rootlets of from two to four inches long; dull yellowish-brown. Odour aromatic, peculiar camphoraceous; taste bitterish, aromatic, and somewhat camphoraceous.

The rhizome and rootlets of Aristolochia reticulata (Red River or Texas Snakeroot) agree essentially with the above, but the rhizome is a little thicker, and the rootlets longer, coarser, and less matted together, and yield more volatile oil. All the Serpentary root produced S.W. of the Rocky Mountains is said to be derived from this species.

Chemistry.—Volatile oil, *aristolochine* (yellow crystalline, bitter), resin, starch, tannin, etc. The volatile oil is a complex body containing a terpene and a borneol ester.

Uses, etc.—Stimulant, tonic and diaphoretic. *Dose.*—10-15 grains.

B.P. Preparations.

Infusum Serpentariæ - - - -	1 in 40.
Tinctura Cinchonæ Composita -	1 in 40.
,, Serpentariæ - - - -	1 in 8 of proof spirit.

Note.—Substitutions and Adulterations.—Care must be taken to distinguish the following:—(1) Valerian, (2) Green Hellebore, and (3) Serpentary rhizomes. 1.—Is not so long, but much thicker and of a somewhat browner colour, and a marked fœtid odour. 2.—The rootlets are thicker and wrinkled. 3.—Very long, brittle rootlets, yellowish; the rootlets have a dark spot running in the centre of each; its odour is more camphoraceous and not so strong as Valerian. The rhizomes of Spigelia, Hydrastis and Senega have been found mixed with the official drug.

Varieties of Serpentary.—Many species of Serpentaria besides the official have been employed in medicine, *e.g.*, A. hirsuta and A. hastata in America, A. cymbifera in Brazil, A. indica in India, etc.

ASARUM.—Wild Ginger.—The rhizome of Asarum canadense.

N.O.—Aristolochiaceæ.

Syn.—Canada Snakeroot.

Habitat.—N. America.

Characters.—Horizontal, four inches or more in length and about one-eighth of an inch in thickness, irregular, quadrangular, finely wrinkled, greyish-brown or purplish-brown, internally whitish, fracture short; rootlets thin; nodes about half an inch apart; aromatic, pungent, bitterish.

Chemistry.—Volatile oil (1½ to 3½ per cent.), resin, *asarin* (bitter principle), mucilage, sugar and alkaloid.

Uses, etc.—Stimulant, carminative, diuretic. Formerly official in the U.S.P.

Note.—*Asarabacca* (Asarum Europœum) has a rhizome very similar to the above, contains volatile oil and has found use as an emetic and cathartic.

ZINGIBER—Ginger.—The scraped and dried rhizome of Zingiber officinale.

N.O.—Zingiberaceæ.

Habitat.—West Indies, India and other countries.

Characters.—In flattish irregularly branched pieces, varying in length, but commonly from about three to four inches, each branch marked at its summit by a depressed scar; externally pale buff and somewhat striated and fibrous; breaking readily with a mealy, short, but rather fibrous fracture. Odour agreeable, aromatic; taste strong, pungent.

Chemistry.—Volatile oil (¼ to 1 per cent. or more), *gingerol* (pungent, viscid liquid soluble in alcohol), resin (5-7 per cent.), ash (about 4 per cent.)

B.P. Preparations.

Confectio Opii	1 part in 12 nearly.
,, Scammonii	1 part in 6 nearly.
Infusum Sennæ	56 grains to 1 pint.
Pilula Scillæ Composita	1 part in 6¼ nearly.
Pulvis Cinnamomi Compositus	1 part in 3.
,, Jalapæ Compositus	1 part in 15.
,, Opii Compositus	1 part in 3.
,, Rhei Compositus	1 part in 9.
,, Scammonii Compositus	1 part in 8.
Syrupus Zingiberis	
Tinctura Zingiberis	1 in 8 of rectified spirit.
,, ,, Fortior	1 in 2 of ,, ,,
Vinum Aloes	40 grains to 1 pint.

Uses, etc.—In medicine as a stimulant and carminative. *Dose.*—10-20 grains in powder. Ginger is also largely used as a flavouring agent.

Note.—Gingerine is the oleo-resinous matter of ginger obtained by treating the powdered rhizome with suitable solvents. OLEO-RESINA ZINGIBERIS, U.S.P., is an ethereal extract.

COMMERCIAL VARIETIES OF GINGER. —The drug is known as *coated* or *uncoated* according to whether or not the epidermal layers have been removed ; the official ginger belongs to the latter class. The commercial varieties bear the names of the countries from which they are imported.

1.—*Jamaica Ginger* (*White Ginger*).—This is uncoated ginger and is naturally pale in colour, but is frequently rendered more white by having been treated with lime salts, *e.g.*, chlorinated lime, sulphite, carbonate of calcium, etc. The presence of these salts in excess, since they increase the percentage of ash, renders the powder of such ginger liable to be looked upon as adulterated.

African Ginger has a light-brown coat and short rhizome.

Chinese Ginger is coated and has a short rhizome with depressed lobes. It is obtained from Alpinia galanga.

East India Ginger is uncoated and in appearance much resembles the Jamaica variety, but is darker in colour.

Note.—Green ginger is the recently-dug undried rhizome ; *Preserved ginger* the same preserved by steeping in hot syrup.

CURCUMA LONGA et ROTUNDA.—Turmeric.—

The swollen rhizomes of Curcuma longa.

N.O.—Zingiberaceæ.

Habitat.—East Indies and Cochin China.

Characters.—Occurs in circular (round turmeric) or oval (long turmeric) pieces, about two inches long and one broad, pointed at one end and marked with annular wrinkles, or somewhat contorted and tuberculated ; yellowish externally ; internally more or less orange-yellow ; odour peculiar and aromatic ; taste aromatic. When chewed tinges the saliva yellow. The powder is rendered of a brown-red colour by alkalies and soluble borates.

COMMERCIAL VARIETIES.—1. *Chinese.*—Central rhizomes and branches. 2. *Bengal.*—Mostly in slender branches of a deep reddish tint. 3. *Madras.*—In thick lateral branches, mixed with transversely cut tubers of a gamboge tint. 4. *Java.*—Small tubers and branches that are often transversely and longitudinally cut. 5. *Cochin China.*—Sections or slices of a large tuber, some having the marks of large depressed scars of former stems.

Chemistry.—Volatile oil (1 per cent.). fixed oil, pungent resin, *curcumin* (an orange-yellow, resinous principle), starch, mucilage, etc.

Uses, etc.—As an ingredient of condiments, curries, etc., and for the preparation of test papers.

Note.—Zedoary, the rhizome of CURCUMA ZEDOARIA (*N.O.*—Zingiberaceæ. *Habitat.*—India) has the following characters :—Circular discs of a tuber, one-half to one and one-half inches in diameter ; orange-brown, internally pale reddish grey-brown, with numerous brown-yellow resin cells and lighter coloured wood bundles ; fracture short, somewhat mealy ; odour and taste like those of ginger. It contains volatile oil and resin, and in properties is similar to ginger.

GALANGÆ RHIZOMA.—Galangal.—The rhizome of Alpinia officinarum, yielding Galanga minor, and the rhizome of Alpinia galanga, yielding Galanga major.

N.O.—Zingiberaceæ.

Habitat.—West Indies.

Characters.—" Major " or Larger.—Cylindrical, three to four inches long, as thick as the thumb or thicker, often forked, reddish-brown externally, slightly striated longitudinally, marked with whitish circular rings, orange-brown internally, rather hard and fibrous, and difficult to powder ; odour agreeable and aromatic ; taste pungent, hot, and spicy. " Minor " or Smaller.—Resembles the preceding in shape, but is not thicker than the little finger, and is of a darker colour, and the taste and smell are stronger.

Chemistry.—Volatile oil, resin, *galangol* (pungent, inodorous), *kempferid* (crystalline), starch, etc.

Uses, etc.—Stimulant, aromatic ; known and used by the Greeks and Arabians. *Dose.*—5-20 grains.

COLCHICI CORMUS.—Colchicum Corm.—The fresh corm of Colchicum autumnale, collected about the end of June or beginning of July ; and the same stripped of its coats, sliced transversely, and dried at a temperature not exceeding 150°F. (65°·5 C.)

N.O.—Liliaceæ.

Habitat.—Indigenous.

Characters.—Fresh corm about one inch and a half long and an inch broad, somewhat conical, flattened on one side where it has a new corm in process of development, and rounded on the other ; covered with an outer thin brown membranous coat, and an inner one reddish-yellow ; internally white and solid, and when cut yielding a milky juice of a bitter taste and disagreeable odour. Dried slices one-eighth or one-tenth of an inch thick, yellowish at their circumference, moderately indented on one side and convex on the other, so that they are somewhat reniform in outline ; the surfaces firm, whitish, amylaceous ; breaking readily with a short fracture ; taste bitter, no odour.

Chemistry.—Starch, gum, sugar, resin, fat and the alkaloid *colchicine*, ·5 per cent.—*(See Colchici Semina.)*

Uses, etc.—Same as the seeds. *Dose.*—2-8 grains in powder.

B.P. Preparations.

Extractum Colchici, from expressed juice, yield 4-5 per cent.

Extractum Colchici Aceticum, from expressed juice, yield 5 to 6 per cent.

Vinum Colchici, 1 of powdered corm in 5 of sherry.

Note.—The Oriental *hermodactyles*, now seldom used, are the dried corms deprived of their outer coats, of probably COLCH. VARIEGATUM. The young corm of the meadow saffron begins life about June as an offshoot from the old one; late in autumn it sends up the flower, but does not vegetate till the following spring; the natural order of vegetation and flowering being thus subverted. It is considered to be most valuable in July after the decay of the leaves, it being then about one year old.

SCILLA.—Squill.—The bulb of Urginea Scilla (Scilla maritima), divested of its dry membranous outer scales, cut into slices and dried.

N.O.—Liliaceæ.

Habitat.—Coasts of the Mediterranean Sea.

Characters.—The slices as seen in the pharmacies are flattish or somewhat four-sided, curved, yellowish-white or somewhat pinkish, from about one to two inches long, translucent, inodorous, disagreeably bitter, brittle and easily pulverisable if quite dry, but tough and flexible when moist.

Chemistry.—Much water, gum, sugar, *sinistrin* $C_6H_{10}O_5$ (a peculiar carbohydrate), inorganic salts, etc. Three active principles have been described, viz.:—*scillipicrin*, *scillitoxin*, *scillin*. The virtues of squill are given up to alcohol, to water, and to acetic acid.

Uses, etc.—Expectorant and diuretic, etc. *Dose.*—1-2 grains in powder.

B.P. Preparations.

Acetum Scillæ - - - - - -	1 in 8 of diluted acetic acid.
Oxymel Scillæ.	
Pilula Ipecacuanhæ cum Scilla,	1 part in 7.
,, Scillæ Composita - -	1 part in 5.
Syrupus Scillæ.	
Tinctura Scillæ - - - - - -	1 in 8 of proof spirit.

Note.—According to Merck, *scillipicrin* is a yellowish white amorphous powder, having a bitter taste, hygroscopic and very soluble in water; *scillitoxin*, a cinnamon brown powder, insoluble in water and ether, but soluble in alcohol, giving a solution having a lasting, bitter, and burning taste, soluble also in alkaline solutions; *scillin*, a pale yellow crystalline powder, tasteless, sparingly soluble in water, soluble in alcohol and boiling ether, from the ether it is again precipitated in a crystalline state on cooling. The later researches of Walisewski point to the presence of four distinct, bitter, crystallizable principles, three of which have been named by him *scillinine*, *scillapicrin* and *scillamarin*.

VERATRI VIRIDIS RHIZOMA.—Green Hellebore Rhizome.—The dried rhizome and rootlets of Veratrum viride.

N.O.—Liliaceæ.

Syn.—Veratri Viridis Radix.

Habitat.—United States and Canada.

Characters.—Entire, or transversely or longitudinally sliced or divided, and either with or without attached rootlets. When entire from one to two inches or more in length, and three-quarters of an inch or more in diameter, erect, obconial, obtuse or truncated at the apex, dark brown externally, whitish within. Frequently bearing at its upper end the concentrically arranged remains of leaves, and giving off on all sides numerous much-shrivelled yellowish-white rootlets several inches long; or the latter are detached and mixed with it, in which case the rhizome is marked with corresponding scars. Inodorous, but exciting sneezing when powdered; taste bitterish and very acrid.

Chemistry.—The rhizome contains several alkaloids the more important of which are *cevadine*, *jervine*, and *pseudojervine*. There are also present resin, starch, and traces of the alkaloids *veratrine*, *veratralbine* and *rubijervine*, the latter being probably identical with *veratroidine;* cevadine and veratrine are found also in cevadilla.

Uses, etc.—Emetic, diaphoretic, sedative, highly poisonous.

B.P. Preparation.

Tinctura Veratri Viridis, 1 in 5 of rectified spirit.

Note.—This drug must be distinguished from the rhizome of Helleborus viridis (*N.O.*—Ranunculaceæ, also known as *green hellebore*), which is totally different.

VERATRI ALBI RHIZOMA.—White Hellebore Rhizome.—The rhizome of Veratrum album.

N.O.—Liliaceæ.

Habitat.—Germany, whence it is imported in a dry state.

Characters.—In pieces from one to three inches long, one inch or less in diameter, cylindrical, or in the shape of a truncated cone; internally whitish; externally blackish, wrinkled, and rough, with the remains of the fibres which have been cut off near their origin. Sometimes the fibres remain attached to the rhizome. They are numerous, wrinkled, yellowish, and of the size of a crow's quill. When dry, odourless; the taste at first is sweetish, afterwards bitterish, acrid, and burning.

Chemistry.—The following alkaloids have been described.—*jervine*, *pseudojervine*, *rubijervine*, *veratralbine* and possibly cevadine. There are also present resin, sugar and *jervic acid.* Two new bases have recently been described as present in the rhizome, viz.—*proto-veratrine* and *proto-veratridine.*

Uses, etc.—Has similar properties to V. viride; rarely given internally. *Dose.*—1-2 grains in powder. The powder has found use in preparing an ointment for itch.

ALLIUM.—Garlic.—The bulb of Allium sativum (Allium ursinum).
N.O.—Liliaceæ.

Habitat.—Indigenous to Southern Europe.

Characters.—Bulbs, sub-globular, compound, consisting of about eight compressed wedge-shaped bulblets, which are arranged in a circle around the base of the stem, and covered by several dry membranous scales. It has a pungent, disagreeable odour, and a warm aromatic taste. It should be preserved in a dry place and used only in the fresh state.

Chemistry.—Water (50 to 60 per cent.), mucilage (35 per cent.), some albumin and about ¼ per cent. of volatile oil, consisting of allyl sulphide $(C_3H_5)_2S$.

Uses, etc.—Stimulant, diuretic, irritant; official in the U.S.P. for the preparation of a syrup containing also acetic acid.

CONVALLARIA.—Lily of the Valley.—The rhizome and rootlets of Convallaria majalis.

N.O.—Liliaceæ.

Habitat.—Europe, etc.

Characters.—Creeping, branched, about one-eighth of an inch thick, cylindrical, wrinkled whitish, internodes 1-3 inches only, marked with a few circular scars, joints annulate and beset with a circle of eight or ten long, branching rootlets; fracture somewhat tough, fibrous, white; taste sweetish, and somewhat acrid; no odour. The whole dried plant has attached to the rhizomes, two or three elliptic, smooth, radical leaves subtending a one-sided raceme of thirteen or more nodding, white, bell-shaped, six-lobed flowers.

Chemistry.—Contains two glucosides *convallarin* and *convallamarin*.

Uses, etc.—Recommended as a substitute for Digitalis. *Dose.*—1-6 grains Official in the U.S.P. for the production of a fluid extract. The B.P.C.F. prepares a tincture from the flowers and stalks and an aqueous extract is made from various parts of the plant on the continent.

Note.—POLYGONATUM MULTIFLORUM, *Solomon's seal* (*N.O.*—Liliaceæ, *Habitat.*—Europe), has a rhizome which is horizontal, jointed, white, and marked at short intervals with small circular impressions, which bear a remote resemblance to those made by a seal; inodorous, and of a sweetish, mucilaginous taste, followed by a slight degree of bitterness and acrimony. It contains convallarin, asparagin, sugar, etc.

POLYGONATUM BIFLORUM, *American Solomon's seal*, has characters and constitution similar to the European drug. SMILACINA RACEMOSA is known as *false Solomon's seal*.

IRIDIS RHIZOMA.—Orris Rhizome.—The rhizome of Iris florentina, I. germanica, etc.; collected in the latter part of the summer, peeled and dried in the sun.

N.O.—Irideæ.

Syn.—Orris root.

Habitat.—Northern shores of the Mediterranean Sea and other parts of Europe.

Characters.—Composed of joints which are two to four inches long, the broadest part near the apex about an inch wide, tapering below and abruptly narrowed above to the circular stem-scar, from two sides of which similar joints are produced. Compressed, and when peeled, of a whitish colour externally and internally. The leaf scars are indicated on the upper surface by the transverse lines of vascular bundles, and the rootlets on the under surface by circular brownish scars, which are more or less crowned near the upper end. Of a firm texture, agreeable violet-like odour, and a mealy bitterish and slightly acrid taste.

Chemistry.—Volatile oil, resin, *iridin* (a glucoside), fat, starch, etc. The volatile oil is said to be a ketone having the formula $C_{13}H_{20}O$; the name *irone* has been given to it.

Uses, etc.—Diuretic and cathartic. *Dose.*—5-15 grains. The chief use of orris root is for the purposes of perfumery. *Oil of orris*, a commercial product, obtained by distilling the root with superheated steam, is a fat, solid at ordinary temperatures, and consisting of a mixture of volatile oil and a compound of myristic acid.

IRIS VERSICOLOR.—Blue Flag.—The rhizome of Iris versicolor.

N.O.—Irideæ.

Habitat.—North America.

Characters.—Rhizome horizontal, consisting of internodes two to four inches long; cylindrical in the lower half, flattish, and about four-fifths of an inch broad near the upper extremity, and terminated by a circular scar; annulated from the leaf sheaths, grey-brown in colour; rootlets long, simple, crowded near the broad end; odour slight; taste acrid, nauseous.

Chemistry.—Acrid resin, fat, sugar, tannin, and, acording to some authorities, an alkaloid.

Uses, etc.—Diuretic and purgative. *Dose.*—5-15 grains. The substance *iridin*, originally prepared by the "Eclectics," is the oleo-resin of the drug obtained by treating a tincture with water. The U.S.P. has an extract and a fluid extract of the drug.

Note.—IRIS FŒTIDISSIMA, I. PSEUDO-ACORUS, I. TUBEROSA have also been used in medicine.

CALAMUS.—Sweet Flag.—The rhizome of Acorus calamus.

N.O.—Aroideæ.

Habitat.—Europe and N. America.

Characters.—In sections of various lengths, unpeeled, about three-quarters of an inch broad, subcylindrical, longitudinally wrinkled; on the lower surface marked with the circular scars of the rootlets in wavy lines; externally reddish-brown, somewhat annulate from remnants of leaf-sheaths; internally whitish, of a spongy texture, breaking with a short, corky fracture, showing numerous oil-cells and scattered wood-bundles, the latter crowded within the subcircular nucleus-sheath. It has an aromatic odour and a strongly pungent taste.

Chemistry.—A bitter glucosidal principle, *acorin* (0·2 per cent.), *calamine* (a strongly basic, crystalline alkaloid) volatile oil (0·1 per cent.), and resin (3 per cent).

Uses, etc.—Stimulant, carminative. *Dose.*—10-60 grains. Official in the U.S.P. for the production of a fluid extract.

TRITICUM REPENS.—Couch Grass.—The rhizome of Triticum (Agropyrum) repens, gathered in the spring and deprived of its rootlets.

N.O.—Gramineæ.

Syn.—Radix graminis, quitch grass, etc.

Habitat.—Europe.

Characters.—Very long, but as met with in the pharmacies, cut into sections about two-fifths of an inch long, and about one-twelfth of an inch thick; creeping, smooth, hollow in the centre, straw-yellow, inodorous, and of a sweet taste.

Chemistry.—*Triticin*, $C_{12}H_{22}O_4$ (tasteless amorphous), and sugars; ash 4 to 5 per cent.

Uses, etc.—Diuretic and nutrient. *Dose.*—in decoction *ad libitum.* Official in the U.S.P. for the production of a fluid extract.

ALETRIS.—Colic Root.—The dried rhizome and rootlets of Aletris farinosa.

N.O.—Hæmodoraceæ.

Syn.—Star-Grass.

Habitat.—South America.

Characters.—A horizontal rhizome, one to two or three inches long, and about one-eighth to two-fifths of an inch thick, being flattish or concave on the upper surface, and densely tufted with light grey fibrous or scaly remnants of leaves. The rootlets are from two to three inches long, wiry, and of a glossy black colour externally, and if more recent, brown, or whitish and soft. No odour; taste bitter.

Chemistry.—A bitter principle, soluble in diluted spirit, is present, and also much starch.

Uses, etc.—Tonic, purgative. *Dose.*—10 grains. The American National Formulary includes a fluid extract.

CYPRIPEDIUM.—Cypripedium.—The rhizome and rootlets of Cypripedium pubescens and of Cypripedium parviflorum.

N.O.—Orchideæ.

Syn.—Ladies' Slipper, American valerian.

Habitat.—United States of America.

Characters.—Horizontal, bent, four inches or less long; about one-eighth of an inch thick; on the upper side beset with numerous, circular, cup-shaped scars; closely covered below with simple wiry rootlets, varying from four to twenty inches in length; brittle, dark brown, or orange brown; fracture short, white; odour faint, but heavy; taste sweetish bitter and somewhat pungent.

Chemistry.—Volatile oil, a volatile acid, gallic and tannic acids, two resins, gum, glucose, starch, and lignin are present.

Uses, etc.—Stimulant and anti-spasmodic; official in U.S.P. for the production of a fluid extract. The 'eclectic' *cypripedin* is a complex resinoid substance, obtained by precipitating with water a concentrated tincture of the rhizome.

GERANIUM.—Geranium.—The rhizome of Geranium maculatum.

N.O.—Geraniaceæ.

Syn.—Cranesbill.

Habitat.—Canada and United States of America.

Characters.—Horizontal, cylindrical, two to three inches long, half an inch or less thick, longitudinally wrinkled, dark brown; fracture short, pale red-brown; bark thin, wood wedges yellowish, small, forming a circle near the cambium line; medullary rays broad, central pith large, rootlets thin, fragile; inodorous; taste astringent

Characters.—Tannic acid (13 to 17 per cent.), starch, pectin, sugar and mucilage.

Uses, etc.—Tonic, astringent. *Dose.*—15-45 grains. Official in the U.S.P. for the production of a fluid extract.

TORMENTILLÆ RHIZOMA.—Tormentil Rhizome.

The rhizome of Potentilla Tormentilla.

N.O.—Rosaceæ.

Syn.—Tormentil.

Habitat.—Europe.

Characters.—Large, cylindrical or roundish, hard, irregular, twisted and branched, of a blood-red or brownish colour internally, and dark red-brown externally. The transverse fracture is not dotted. Taste astringent, not acrid.

Chemistry.—Contains *tormentil-tannic acid* (18 per cent.), kinovic acid, a little volatile oil, gum, and a colouring matter, *tormentil-red* (18 per cent.), which is soluble in alcohol but insoluble in water.

Uses, etc.—Tonic, astringent. *Dose.*—10-30 grains.

GEUM URBANUM.—Water Avens.—The dried rhizome and rootlets of Geum urbanum.

N.O.—Rosaceæ.

Syn.—Radix Caryophyllata.

Habitat.—Europe.

Characters.—Short, oblong, from a quarter to half an inch thick, brown externally, white within, with a reddish centre; and furnished with numerous long descending fibres. Inodorous or slightly clove-like when fresh, taste bitterish and astringent.

Chemistry.—A little volatile oil, tannic acid, gum, resin and lignin.

Uses, etc.—Astringent, tonic. *Dose.*—15-30 grains.

BISTORT.—Bistort.—The dried rhizome of Polygonum bistorta.

N.O.—Polygonaceæ.

Syn.—Snakeweed.

Habitat.—Europe.

Characters.—The rootstock is perennial, woody, tortuous, dark brown externally, reddish within, about the thickness of the finger, and furnished with numerous slender fibres.

Chemistry.—Tannic acid, starch, and red colouring matter are present.

Uses, etc.—Tonic, astringent. *Dose.*—8-30 grains.

COLLINSONIA.—Stone root.—The rhizome and rootlets of Collinsonia Canadensis.

N.O.—Labiatæ.

Habitat.—North America.

Characters.—Horizontal, about four inches long and with short, knotty, irregular branches; stem scars numerous, shallow; externally brown-grey; very hard; internally greyish or whitish; bark very thin; wood wedges irregular; rootlets numerous rather brittle; nearly inodorous; taste bitterish and nauseous.

Chemistry.—Resin, tannin, starch, mucilage and wax.

Uses, etc.—Sedative, antispasmodic, astringent and tonic. *Dose.*—10-60 grains. A non-official liquid extract and tincture (1 in 4) are prescribed.

LEPTANDRA.—Leptandra.—The rhizome and rootlets of Leptandra (Veronica) virginica.

N.O.—Scrophulariaceæ.

Syn.—Culver's Root.

Habitat.—Canada and United States.

Characters.—Horizontal, from four to six inches long, and about a quarter of an inch thick, somewhat flattened, bent and branched, dark blackish-brown, with cup-shaped scars on the upper side, hard, of a woody fracture, with a thin, blackish bark, a hard, yellowish wood, and a large, purplish-brown, about six-rayed pith; rootlets thin, wrinkled, very fragile, inodorous, taste bitter and feebly acrid.

Chemistry.—Tannic acid, gum, resin, trace of volatile oil, and a bitter principle *leptandrin*. The so-called leptandrin of the "Eclectics," which is obtained by precipitating the concentrated tincture with water, owes its properties to the presence in it of the above bitter principle.

Uses, etc.—Alterative, cathartic. *Dose.*—15-60 grains; official in the U.S.P. for the production of an extract and a fluid extract.

MENISPERMUM.—Canadian Moon-seed.—The rhizome and rootlets of Menispermum Canadense.

N.O.—Menispermaceæ.

Syn.—Yellow Parilla

Habitat.—Canada.

Characters.—Rhizome several feet long, about a quarter of an inch thick, yellowish-brown or brown, finely wrinkled longitudinally, and beset with numerous thin, rather brittle rootlets; fracture tough, woody; internally yellowish, with a thickish bark, a circle of porous, short, nearly square, wood wedges, and a large, central pith; nearly inodorous; taste bitter.

Chemistry.—A white alkaloid *menispine*, a little berberine, together with starch and resin.

Uses, etc.—Tonic and diuretic. *Dose.*—15-60 grains; official in the U.S.P. for the production of a fluid extract.

4. WOODS.—LIGNA.

Histology, etc., of Woods.—The woods which are made use of in medicine consist in the majority of cases of that portion of the trunk of dicotyledonous trees which is known as the *heart-wood* or *duramen*. A transverse section of the trunk of a full-grown tree shows a central speck, the *pith*, surrounded by a huge mass of wood bounded externally by the cambium cylinder which is itself enclosed by the several-layered bark. The woody substance is divided up into wedges of varying thickness by plates of tissue passing through it at intervals and appearing in transverse sections as lines radiating from the centre to the circumference; these radial plates of tissue are the *medullary rays* and like the wood have been developed by the activity of the cambium cylinder.

The wood proper or *xylem* is made up of *wood vessels, tracheids, wood fibres, and wood cells.* The vessels or *tracheæ* consist of elongated communicating segments placed vertically end to end, the walls of which show various local thickenings in the form of rings, pits, etc.; the varying nature of these thickenings gives rise to the terms *annular, spiral, reticulate, pitted,* etc., vessels; the calibre of the vessels varies, spiral vessels being relatively narrow, pitted vessels wide. The wood-fibres are long cells with pointed ends and thick walls, occasionally bearing slit-like markings, and thus differing from the tracheids which are similar fibres having bordered pits. The cells of the wood consists of vertical groups of short parenchymatous cells each having pitted walls and the fusiform shape of a tracheid, and during the winter period of rest these cells are loaded with starch grains. The medullary rays are made up of parenchymatous cells in single double or broader rows arranged radially. The so-called *annual rings* which are observed on examining a section of wood taken at right angles to the direction of its growth are produced by the contrast between the calibres of the wood elements formed in the Spring and Autumn respectively, the latter being for physiological reasons wider than the latter.

At a certain period in the life of a tree the change from *sap-wood* or *alburnum* to *heart-wood* or *duramen* takes place; this is brought about by the infiltration of various chemical substances into the cells and cell walls of the sapwood; no anatomical change takes place in the latter but starch ceases to be deposited in it, and except for its resistant qualities it no longer takes a part in the life-processes of the tree.

General Chemical Properties of Woods.—The substances which render woods valuable in medicine and the arts are in the majority of cases the *resins, volatile oils* and other principles by the infiltration of which the conversion of sap-wood into heart-wood takes place. The remaining substance of the woods consists of carbohydrates (*lignin, wood gum,* etc.), various inorganic salts, etc.

GUAIACI LIGNUM.—Guaiacum Wood.—

The heartwood of Guaiacum officinale or of Guaiacum sanctum. For use in pharmacy the wood, as usully imported, should be deprived of its sapwood and the heartwood reduced to the form of chips, raspings or shavings.

N.O.—Zygophylleæ.

Syn.—Lignum Vitæ.

Habitat.—St. Domingo and Jamaica.

Characters.—The chips, raspings or shavings, as seen in the pharmacies, are dark greenish-brown; their taste, when chewed for a short time, is acrid and somewhat aromatic; and their odour, when rubbed, and more especially when heated, agreeable and faintly aromatic. When touched with nitric acid they assume a temporary bluish-green colour; and if moderately heated in a solution of perchloride of mercury, a bluish green colour is also produced.

Chemistry.—Resin 20 to 25 per cent. *(see Guaiaci resina)*; extractive 3 to 4 per cent.; ash 6 per cent.

Uses, etc.—The wood enters into the official compound decoction of sarsaparilla; its chief use, however, is for the purposes of the turner.

B.P. Preparation.

Decoctum Sarsæ Compositum - - - -	1 in 80.

Note.—When in chips, Guaiacum wood often presents a mixed appearance, because the sapwood or alburnum, the newer and softer portion of the stem, has a pale yellow colour (it is also tasteless), while the duramen or heartwood is dense and of a dark greenish-brown colour; the latter has a S.G. of 1·3, and by contact with nitric acid becomes greenish. A microscopic examination shows the wood to be chiefly made up of ligneous cells filled with resin.

QUASSIÆ LIGNUM.—Quassia Wood.—

The chips, shavings or raspings of the wood of Picræna excelsa (Quassia excelsa).

N.O.—Simarubeæ.

Syn.—Bitter Wood.

Habitat.—Jamaica.

Characters.—In billets or logs, varying in length and size, but frequently as thick as a man's thigh, and covered by a dark-grey bark. The wood is dense, tough, porous, and of a pale yellowish-white colour. In the pharmacies it is commonly met with in the form of chips, shavings, or raspings of the wood only, which are inodorous, but have an intense and purely bitter taste. An infusion does not become black or bluish-black on the addition of a persalt of iron.

Chemistry.—The bitterness of the wood is due to the presence of *quassin* ($C_{32}H_{44}O_{10}$), a crystalline bitter substance soluble in alcohol and water, and converted into *quasside* ($C_{32}H_{42}O_9$) by the action of dilute sulphuric acid. Tannin is absent.

Uses, etc.—As tonic and stomachic. Bitter cups are turned from the wood and non-poisonous fly-papers prepared from the aqueous extract.

B.P. Preparations.

Extractum Quassiæ - -	aqueous; yield 2-3 per cent.
Infusum Quassiæ - - -	about 1 in 80.
Tinctura Quassiæ - - -	1 in 27 of proof spirit.

Note—The wood of QUASSIA (SIMARUBA) AMARA *(Surinam quassia)* was formerly official as a source of quassia. It is denser than that of Picræna excelsa, and the medullary rays are usually only one cell in thickness. It is said to contain four principles, one of which is identical with quassin.

HÆMATOXYLI LIGNUM.—Logwood.—

The sliced heartwood of Hæmatoxylon Campechianum.

N.O.—Leguminosæ.

Habitat.—Campeachy, Honduras and Jamaica.

Characters.—The logs, in which form it is imported, are hard, heavy, blackish-red externally and internally reddish-brown.

The chips as directed to be used have a reddish-brown colour, a slight peculiar agreeable odour, and a sweetish astringent taste. When chewed they colour the saliva a brilliant dark reddish-pink colour.

Chemistry.—The essential constituent is *hæmatoxylin* $C_{16}H_{14}O_6$ (9 to 12 per cent.) When pure it is in colourless crystals, but on exposure to air (oxygen) and alkalies (ammonia) it becomes coloured, owing to the production of *hæmatein*, a dark violet-coloured substance, which again may be reduced to hæmatoxylin by the action of nascent hydrogen, sulphurous acid, etc.

Uses, etc.—In medicine as a mild astringent; in the arts as a dye, ingredient of inks, etc.

B.P. Preparations.

Decoctum Hæmatoxyli, 1 in 20.

Extractum Hæmatoxyli, aqueous, dry; yield 10 per cent.

Note.—A microscopic examination of logwood shows the colouring matter to reside chiefly in the walls of the ligneous tissue. The wood gives 3 per cent. of ash and yields a good charcoal for medicinal use. The logs have a S.G. of 1·057. The chips are often marked with patches of a greenish hue, due to the formation of hæmatein. The extract, which is evaporated to dryness because there is nothing of an adhesive nature present in the wood, has been mistaken for kino, but it is less astringent and of a sweetish taste. *Brazil wood* [CÆSALPINIA (species variæ.) *N.O.*—Leguminosæ. *Habitat.*—Brazil.] may be distinguished from logwood by the fact that its colouring matter, *brazilin* ($C_{16}H_{14}O_5$), forms a red solution with the alkalies, whereas with logwood infusion a purple colour results; formerly used in medicine, etc., it now finds application only as a dye.

PTEROCARPI LIGNUM.—Red Sandal-wood.

—The sliced or rasped heartwood of Pterocarpus Santalinus.

N.O.—Leguminosæ.

Syn.—Red Sanders-wood; Santalum rubrum.

Habitat.—Ceylon and Malabar.

Characters.—As imported it is in dense heavy irregular logs varying in length and thickness, dark reddish brown or blackish-brown externally and internally, if cut transversely, deep blood-red variegated with zones of a lighter red colour. It is usually found in the pharmacies in the form of raspings or small chips, which are deep reddish-brown in colour, very slightly astringent in taste, and when rubbed of a faint peculiar odour.

Chemistry.—*Santalin* or *santalic acid* ($C_{15}H_{14}O_5$), a crystalline red-coloured body, soluble in alcohol, ether, and alkalies, insoluble in water; three other crystalline principles, viz.:—*santal*, *pterocarpin*, *homo-pterocarpin* have also been described as being present in the wood.

Uses, etc.—Valueless as a medicine; used in pharmacy for colouring tinctures and in the arts as a dye.

B.P. Preparation.

Tinctura Lavandulæ Composita.

Note.—Barwood is the wood of PTEROCARPUS ANGOLENSIS and is imported from W. Africa. *Camwood*, said to be derived from BAPHIA NITIDA, is likewise obtained from the west coast of Africa, *e.g.*, Gaboon, etc.

The colouring principles of the above dye-woods, and of Sanders-wood, are nearly allied if not identical.

SANTALUM ALBUM.—Sandal-wood.—The heartwood of Santalum album.

N.O.—Santalaceæ.

Habitat.—Southern India.

Characters.—In billets four feet in length and varying in diameter, colour from whitish to brownish-yellow, those of a deeper colour being more highly valued than the paler varieties. The wood is hard and heavy, when cut transversely it has a somewhat waxy lustre and exhibits irregular concentric zones, alternately lighter and darker in colour, sometimes rather indistinct, with very fine vessels and delicate medullary rays. When rubbed or rasped it has an agreeable, aromatic, somewhat roseate odour; its taste is bitterish, aromatic, and slightly acrid.

Chemistry.—The valuable constituent of the wood is the essential oil, the yield of which (*see Oleum Santali*) varies according to the quality of the wood; the best kinds give about 3 per cent.

Uses, etc.—The wood finds use as a source of the oil; is also made into fancy articles, and used as an ingredient of incenses. In India it figures in burial rites.

Note.—VARIETIES OF SANDAL-WOOD.—*Indian Sandal-wood*, which is the officially-named source for the oil, is though not cultivated, a Government monopoly. When the trees die the sapwood and smaller branches are removed, and they are then cut up into logs or billets. The billets are arranged in classes according to their relative value; those from the roots being regarded as most valuable, the so-called *jajpokal* (hollow) and *bagaradad* (branches) ranking last.

Other varieties of Sandal-wood are obtained from the Sandwich Islands (source—S. FREYCINETIANUM; from the Fiji Islands (source—S. YASI); from Western Australia (source—FUSANUS SPICATUS); from New Caledonia (source—S. AUSTRO-CALEDONICUM).

5. LEAVES.—FOLIA.

The perfect leaf consists of three parts, viz.:—the *blade* or *lamina*, the *stalk* or *petiole*, and the *stipules*. The two latter are often wanting, and a leaf having no stalk is said to be sessile. By duration leaves are *deciduous*, *i.e.*, lasting for a single season, or *persistent*, in which latter case the leaves when they fall are replaced by others, thus rendering the plant evergreen. The veining or *venation* of leaves is of two kinds, viz., *parallel-veined* (Monocotyledons), reticulate or *netted-veined* (Dicotyledons). Parallel-veined leaves may have the veins arranged longitudinally, transversely, or radiately (palms) while the veins of netted veined-leaves may be arranged either pinnately (senna) or palmately (aconite). Leaves are either *simple*, *i.e.*, one on each leaf-stalk, or *compound*, when each leaf-stalk has two or more leaflets.

The general outline or circumscription of leaves takes various forms, *e.g.*, *linear* (rosemary); *lanceolate* (senna); *ovate* (belladonna); *orbicular* (mallows); *cuneate* (Barosma betulina); *spathulate* (bearberry); *cordate* (coltsfoot); *reniform* (hepatica); *auriculate* (woody nightshade); *sagittate* (convolvulus); *peltate*, etc.

The apex of the leaf may be pointed or blunt, the different forms met with being described by such terms as—*acuminate* (stramonium); *acute* (Indian senna); *obtuse* (bearberry); *truncate* (Barosma serratifolia); *retuse* (Barosma betulina); *emarginate* (jaborandi), etc.

The margin of the leaf may be entire (jaborandi, eucalyptus, etc.) or cut, or divided in various ways. When the margin is cut it may be *serrate* (Barosma serratifolia); *crenate* (digitalis); *undulate* (hamamelis); *sinuate* (stramonium); *incised* (aconite); *spiny* (holly); *crisped* (parsley), etc.

Frequently the margin of a leaf is deeply segmented and it is said to be divided, parted, cleft, or lobed according to the depth or extent of the segmentations. These divisions, parts, clefts, and lobes are said to be pinnate or palmate according to the disposal of the segments; similarly compound leaves are said to be either pinnately or palmately compound or decompound according to the disposal and number of the leaflets, *e.g.*, hemlock leaves are pinnately decompound; those of aconite are palmately three or five parted, etc.

In texture, leaves may be coriaceous or leathery, but more commonly they are thin and fragile, and when dry, papery. Hairs are frequently present, more especially on the under sides of leaves, and these are not uncommonly of a glandular nature. The presence of oil glands, frequently in the form of short cavities lying immediately under the epidermis, (Rutaceæ) is a common feature of the medicinal leaves.

General Chemistry of Leaves.—Besides albumin, carbohydrates, chlorophyll, wax, inorganic salts, etc., the medicinal leaves contain various other bodies, those most frequently met with being perhaps tannin and some kind of volatile oil. Other active substances found are alkaloids, resins, glucosides, bitter principles, etc. The amount of ash present is frequently large, amounting in some cases to as much as 16 or 17 per cent.

ACONITI FOLIA.—Aconite Leaves.—The fresh leaves and flowering tops of Aconitum Napellus, gathered when about one-third of the flowers are expanded from plants cultivated in Britain.

N.O.—Ranunculaceæ.

Syn.—Monkshood, wolfsbane.

Habitat.—Britain.

Characters.—Leaves alternate, with long channelled stalks, very deeply cut palmately into five or three segments, which are again deeply and irregularly divided into oblong, acute, narrow lobes; exciting slowly, when chewed, a sensation of tingling and numbness. Flowers large, irregular, deep blue, in a somewhat loose terminal raceme.

Chemistry.—Alkaloid about ·3 per cent. of dried leaf (*see Aconiti radix*).

Uses, etc.—As Aconite root. *Dose.*—1-2 grains in powder.

B.P. Preparation.

Extractum Aconiti, from expressed juice; yield about 6 per cent.

Note.—The dried leaves when met with, usually consist of small fragments of the channelled leaf segments, and the conspicuous blue flowers are often also present. From the dried leaves, extracts both aqueous and alcoholic are included in some of the Continental Pharmacopœias.

HEPATICA.—Liverwort.—The leaves of Anemone hepatica and Anemone acutiloba.

N.O.—Ranunculaceæ.

Habitat.—N. America and Europe.

Characters.—Broad kidney-heart-shaped, about two inches long and broad, long-petiolate, three-lobed, the lobes obtuse or acute; slightly leathery; smooth and dark-green above; inodorous, insipid, slightly astringent, slightly bitterish.

Chemistry.—Mucilage, sugar, tannin, etc.

Uses, etc.—Demulcent, tonic. *Dose.*—30-120 grains in decoction, etc.

THEÆ FOLIA.—The specially prepared leaves of Camellia Thea. (Thea Sinensis.)

N.O.—Camelliaceæ.

Habitat.—China; cultivated in Brazil, India, etc.

Characters.—Occur in commerce as little cylinders or rolls, into which the leaves have been twisted during the manipulation of rolling. After maceration and unfolding the perfect leaves will be found to be from one to two inches long; oval, obovate, or oblanceolate in shape; shortly petiolate, pointed at both ends, or blunt, sometimes emarginate at apex, and irregularly toothed at the margin. They have a prominent midrib with the lateral branches curved upwards, near the margin. The colour is sometimes heightened by means of "facings" of Prussian blue, gypsum, or plumbago, and an artificial odour is said to be imparted to the leaves by the admixture of various aromatic flowers which are subsequently removed.

Note.—The various teas are supposed to be derived from two varieties of one species, viz. T. BOHEA and T. VIRIDIS. The *bush* tea of Cape Colony is obtained from a species of CYCLOPIA.

Chemistry.—Tannin (10 per cent.), *boheic acid*, volatile oil, aqueous extract (about 50 per cent.), albumin, wax, resin, ash (4-6 per cent.), and *thëine* or caffeine (2½-4 per cent.) Recently a second alkaloid *theophylline* ($C_7H_8N_4O_2$) has been described as occurring with caffeine in tea.

CAFFEINA, B.P. THEINA, GUARANINA (trimethyl-xanthine, $C_8H_{10}N_4O_2,H_2O$), may be prepared from tea in various ways (1) by removing astringent and colouring matters from the infusion by means of lead acetate and adding sodium carbonate to the filtered liquid; (2) by treating a mixture of tea dust and lime or magnesia with boiling chloroform; it may also be obtained by sublimation. It occurs in fine interwoven needles, crystallizing with one molecule of water which it loses at 100°C.; on heating to 178°C the anhydrous alkaloid melts. It is soluble in 68 parts of water, in 40 of rectified spirit, in 7 of chloroform and readily in boiling water. It gives a precipitate with tannic acid which is soluble in an excess of the reagent. It is a valuable cardiac tonic and diuretic. *Dose.*—1-5 grains. From caffeine the official CAFFEINÆ CITRAS is prepared; other salts used in medicine are the hydro-bromate, iodide, sodio-salicylate, valerianate, etc.

COCA.—Coca.—The dried leaves of Erythroxylon Coca.
N.O.—Lineæ.

Syn.—Cuca.

Habitat.—Bolivia and Peru.

Characters.—Shortly stalked, oval or lanceolate, of varying thickness, one to two inches or more in length, entire, usually blunt and emarginate, quite smooth; midrib prominent, with numerous faint freely anastomosing lateral veins, and on each side of the midrib a curved line extends from base to apex; green above, somewhat paler beneath. In commercial specimens the leaves are more or less broken, and frequently yellowish-green, yellowish-brown, or brown, and in rare cases the curved lines are indistinguishable. Odour faintly tea-like, especially when bruised; taste somewhat bitter and aromatic.

Commercial Varieties.—The Peruvian or Truxillo Coca leaves are frequently three times as large as the Brazilian or Huanuco variety, and the latter are more highly prized. A third variety is obtained from Java, the constituents and properties of which differ from those of the official leaves.

Chemistry.—Coca contains the alkaloids *cocaine* (formerly called *erythroxyline*), *cinnamyl-cocaine*, and *cocamine* (*truxilline*). Cocaine is present in largest quantity in Bolivian Coca; the two latter alkaloids form a large proportion of the total alkaloid of the Peruvian variety. *Hygrine*, an oily volatile body has also been described as being present in the leaves but it is a question whether or not it is a decomposition product obtained in the assay. Java Coca and to some extent the other varieties also, contain yet another alkaloid which has been called *tropacocaine* (benzoyl pseudotropeine). A tannin *(cocatannic acid)* and wax are also present in all the varieties.

Uses, etc.—As stimulant, diaphoretic and restorative. *Dose.* —15-60 grains. It is highly valued as a sustenant by the natives of Peru and Bolivia by whom it is mixed with lime and chewed.

B.P. Preparations.

Extractum Cocæ Liquidum - - - 1 in 1.
Cocainæ Hydrochloras.

Note.—A solid alcoholic extract and a wine are also largely used. The wine which may be prepared by macerating the leaves in sherry or by using an equivalent quantity liquid extract is official in some of the continental Pharmacopœias.

Cocaine Hydrochloras B.P. ($C_{17}H_{21}NO_4$, HCl) may be obtained by agitating with ether an aqueous solution of an acidulated alcoholic extract made alkaline with carbonate of sodium; separating and evaporating the etherial liquid, purifying the product by repeating the treatment with acidulated water, carbonate of soda and ether; decolorising, neutralizing with hydrochloric acid and crystallizing. The salt forms almost colourless acicular crystals soluble in half their weight of water, in 2½ parts of rectified spirit and of glycerine, about 1 in 20 of chloroform, almost insoluble in ether and insoluble in fixed oils. It dissolves without colour in cold concentrated acids and leaves no residue on ignition. Its aqueous solution is bitter, dilates the pupil of the eye and produces a tingling sensation on the tongue. It yields a yellow precipitate with chloride of gold and should show little or no cloudiness with chloride of barium and oxalate of ammonium. It gives white precipitates with ammonia and ammonium carbonate, the former soluble in excess. For general purity the permanganate test is useful, viz.:—$\frac{1}{10}$ grain of the salt dissolved in 5 cc of water acidulated with sulphuric acid and mixed with $\frac{1}{2}$ cc of $\frac{1}{10}$ per cent. solution of permanganate of potassium should give a colour not disappearing under an hour.

Uses, etc. –A local anæsthetic; also internally. *Dose.*—$\frac{1}{5}$-1 grain.

B.P. Preparations.

Lamellæ Cocainæ	- - - -	containing $\frac{1}{200}$ grain.
Liquor Cocainæ Hydrochloratis	-	,, 10 per cent.

Note.—COCAINE ($C_{17}H_{21}NO_4$) occurs in colourless, transparent prisms, soluble in 700 parts of water, freely soluble in ether. On heating with hydrochloric acid it breaks up into methyl-alcohol, benzoic acid and *ecgonine* ($C_9H_{15}NO_3$), and it is thus shown to be the methyl-ester of benzoyl-ecgonine. Ecgonine, which is the basis of all the Coca alkaloids and is itself probably present in the leaves, is a derivative of tetrahydropyridine, and since tropine, the decomposition product of atropine, is regarded as being a tetrahydropyridine, a well-defined chemical relationship between cocaine and atropine is established.

BUCHU FOLIA.—Buchu Leaves.—The dried leaves of (1) Barosma betulina, (2) Barosma crenulata, (3), Barosma serratifolia.

N.O.—Rutaceæ.

Syn.—Diosma leaves.

Habitat.—Cape of Good Hope.

Characters.—Smooth, serrate, somewhat dentate or crenate, and marked on the margins, and especially on their under surface, with oil glands. Their colour is dull yellowish-green; odour strong, penetrating and peculiar; taste aromatic, bitterish and mint-like. 1. From half an inch to three-quarters of an inch long, cuneate or rhomboid-obovate, serrate-dentate, apex very blunt and usually recurved; texture more cartilaginous than in the other species. 2. From three-quarters to about an inch and a quarter long, thickish, oval-oblong, or rhomboid-oval, somewhat blunt at the apex, narrowed at the base into a distinct petiole, finely serrate or crenate-serrate. 3. From an inch to an inch and a half long, linear-lanceolate, equally tapering to each end, actual apex truncate, sharply and closely serrate; texture thinner than in the other species.

Chemistry.—The leaves of the first-named variety contain volatile oil (1·5 per cent.), the other varieties, which are rarely if ever met with in commerce, contain not more than one-third as much, and a peculiar bitter principle called *barosmin* or *diosmin* has also been described. The other constituents are—resinous, gummy, albuminous, and colouring matters and salts. The ash amounts to 4 to 5 per cent., and contains a notable quantity of manganese. By exposing the volatile oil of Buchu to a low temperature, *barosma-camphor (diosphenol)*, a stearoptene fusing at 85° C., crystallises out.

Uses, etc.—As tonic, diaphoretic and diuretic, given chiefly in urinary diseases. *Dose.*—20-30 grains in powder.

B.P. Preparations.

Infusum Buchu - - - -	1 in 20.
Tinctura Buchu - - - -	1 in 8 of proof spirit.

Note.—The short Buchu is sometimes mixed with the flowers and non-aromatic capsules of the plant. The long Buchu is usually free from these, but the leaves of Empleurum Serrulatum, a Rutaceous plant growing in the same districts as Buchu, are occasionally present in very large proportions. The characters of these leaves are—from one to three inches long, having a narrow linear shape, a serrulated margin, and an acute apex, without any oil duct.

JABORANDI.—Jaboranḍi.—The dried leaflets of Pilocarpus pennatifolius.

N.O.—Rutaceæ.

Habitat.—Pernambuco (South America).

Characters.—Leaflets very shortly stalked, usually four inches or more in length, oval-oblong or oblong-lanceolate, somewhat unequal at the base, obtuse and emarginate, slightly revolute and entire at the margins, coriaceous. Upper surface glabrous, except when young, dull green ; under surface paler, often somewhat hairy, with a very prominent midrib, and seen to be marked irregularly all over with pellucid dots when held against the light. Odour when bruised slightly aromatic ; taste on chewing slightly bitter and aromatic at first, but subsequently pungent and increasing the flow of saliva.

It has recently been shown by Holmes that Pernambuco jaborandi is the product of Pilocarpus Jaborandi ; the leaflets of P. pennatifolius (Paraguay jaborandi), are usually obovate-lanceolate rather than oblong; of a thinner and more paper-like consistence, of a grey-green hue, and are similarly furnished with oil glands.

Note.—Varieties of Jaborandi.—In addition to the two species mentioned above, the leaflets of several others are sometimes met with in commerce. *Ceara Jaborandi.*—This variety is obtained from a hitherto undescribed species, for which the name Pilocarpus trachylophus has been suggested. The leaflets are distinguished by having a hairy under-surface, and by not causing a flow of saliva when chewed ; the fruit also is readily distinguishable from that of P. jaborandi. *Rio Janeiro jaborandi*, the product of P. Selloanus, is similar to the Pernambuco variety, but has more fleshy leaflets, which are further distinguished by being elliptic-oblong in shape and by having the veinlets more prominent on the upper surface.

The leaflets of a species which has been named P. Microphyllus have also been met with ; these are small, cuneate at the base, and almost entirely free from hairs on the under-surface.

Other jaborandis are the leaves of several species of Piper, the term being applied in Brazil in a generic sense to various pungent, sudorific plants.

Chemistry.—Volatile oil 4 per cent. (containing dipentene and other hydrocarbons) and the alkaloids *pilocarpine* ($C_{11}H_{16}N_2O_2$) and *jaborine* ($C_{22}H_{32}N_4O_4$). By the action of acids and alkalies pilocarpine is converted into *pilocarpidine* ($C_{10}H_{14}N_2O_2$), which is a pyridine derivative.

Uses, etc.—Diaphoretic, etc. ; antagonistic to belladonna. *Dose.*—5-60 grains.

B.P. Preparations.

Extractum Jaborandi	alcoholic and aqueous.
Infusum Jaborandi	1 in 20.
Tinctura Jaborandi	1 in 4 of proof spirit.
Pilocarpinæ Nitras.	

PILOCARPINÆ NITRAS B.P. ($C_{11}H_{16}N_2O_2,HNO_3$), is described by the Pharmacopœia as the nitrate of an alkaloid obtained from extract of Jaborandi by shaking it with chloroform and alkali, evaporating the chloroformic solution, neutralizing the product with nitric acid and purifying by re-crystallization. It occurs as a white crystalline powder or in acicular crystals, soluble 1 in 8 of water, 1 in 50 of rectified spirit. With strong sulphuric acid it gives a yellowish solution, which on the addition of bichromate of potassium acquires an emerald-green colour. *Dose.*—$\frac{1}{20}$-$\frac{1}{2}$ grain. From it are prepared various "guttæ" and hypodermic injections. The hydrochlorate of pilocarpine is official in the Pharmacopœia of the United States and in several of those of the European Continent.

SENNA ALEXANDRINA.—Alexandrian Senna.

—The dried leaflets of Cassia acutifolia (Cassia lanceolata). It is imported from Alexandria and sometimes in a more or less contaminated condition, in which case the true Senna leaflets should be carefully separated from all extraneous matter.

N.O.—Leguminosæ.

Habitat.—N.E. Africa.

Characters.—About three-quarters of an inch to more than an inch long, lanceolate or oval-lanceolate, acute, unequal at the base, entire, thin, brittle, pale yellowish-green, evidently veined on the lower surface, and very finely pubescent or nearly smooth. Odour peculiar, faint, tea-like; taste mucilaginous, nauseous, and sickly.

The main difference between the two sennas is that the leaflets of the Alexandrian are of a different shape, shorter and brittle, while those of the Indian are lanceolate, acute, two inches long, flexible. The inequality of the base and freedom from bitterness render Senna leaflets easily identifiable.

Varieties of Senna.—Besides the Alexandrian and Indian Sennas, others are met with in commerce, either alone or as an admixture of the official kinds. Of these the more important are *East Indian*, or *Bombay Senna*, probably derived from the Cassia elongata of Lemaire; this is collected in Arabia and sent to Europe and the United States viâ Bombay, and it is known by the French as *Sené de la pique*, on account of the great length and narrowness of the leaflets; *Tripoli Senna* (Cassia Æthiopica) like Alexandrian, but having the leaflets in fragments; *American Senna* (Cassia Marilandica); *Italian* and *Jamaica* kinds (Cassia obovata) so called because cultivated in these countries, and known by the Arabs as *Senna baladi*, but not now collected. Great care has to be paid to the sorting of senna leaves, for not only do leaves of other plants find their way into the bales, but also such extraneous matters as dust, dirt, date-stones, twigs, petioles, fruits, flowers, etc.

Chemistry.—*Cathartic acid*, ·9 per cent. (the active principle) is a glucoside, which, when pure, is black, entirely soluble in ether and chloroform, and almost insoluble in water and strong alcohol. It occurs in combination with calcium and magnesium, and is dissolved out by water. It is destroyed by a heat above 60° C.; when boiled with dilute acids, glucose and *cathartogenic acid* result. There are also present,—a little volatile oil; a yellow colouring principle; chrysoretin (chrysophan); *catharto-mannite* (*sennite*), a saccharine body; *sennacrol* and *sennapicrin* (both bitter principles, the former soluble in ether, and the latter insoluble); with tartaric, oxalic, and malic acids. The ash amounts to about 9 per cent., consisting chiefly of earthy and alkaline carbonates. The best solvent of senna is weak alcohol; prolonged decoction of the leaves entirely destroys their purgative power.

Uses, etc.—As a general purgative. *Dose.*—10-30 grains in powder.

B.P. Preparations.

Confectio Sennæ - - - - -	1 part in 11, about.
Infusum Sennæ - - - - -	1 in 10.
Mistura Sennæ Composita. - -	containing the infusion.
Pulvis Glycyrrhizæ Compositus,	1 part in 6.
Syrupus Sennæ - - - - -	1 in 2.
Tinctura Sennæ - - - - -	1 in 8 of proof spirit.

Note.—SUBSTITUTIONS AND ADULTERATIONS.

Bladder Senna Leaflets (COLUTEA ARBORESCENS. *N.O.*—Leguminosæ). These have equal bases, are elliptical in outline, and bluntly pointed; a Continental substitution.

Coriaria Myrtifolia Leaves.—A Mediterranean shrub. (*N.O.*—Coriaraceæ). As these leaves are poisonous, this is a very serious admixture. They are ovate-lanceolate, equal at the base, three-veined, with a strongly marked mid-rib. The two lateral veins run in a longitudinal direction along the leaf until they reach the apex, where they disappear.

Tephrosia Leaflets and Legumes. (TEPHROSIA APOLLINEA. *N.O.*—Leguminosæ, from the banks of Nile). These have a silky or silvery aspect, obovate-oblong, emarginate at apex, equal at base, usually folded longitudinally on their mid-rib. The legume is an inch to an inch and a half long, not exceeding one-sixth of an inch broad, linear, slightly ensiform, and contains six to seven brownish seeds.

Argel Leaves—[SOLENOSTEMMA (VEL CYNANCHUM) ARGEL. *N.O.*—Asclepiadaceæ, from Nubia].—These are paler in colour, more coriaceous, and have less conspicuous veins, and an equal base. The fruits are small and pear-shaped, and not like legumes.

Jaborandi Leaflets.—The leaflets of PILOCARPUS MICROPHYLLUS have been imported under the name of Senna.

SENNA INDICA.—East Indian Senna.—

The dried leaflets of Cassia angustifolia (Cassia elongata). From plants cultivated in Southern India; it is imported without admixture of other leaves or extraneous matters of any kind.

N.O.—Leguminosæ.

Syn.—Tinnivelly Senna.

Habitat.—Southern India.

Characters.—From about one inch to two inches in length, lanceolate, acute, unequal-sided at the base, thin, entire, yellowish-green and smooth above, somewhat duller beneath, and glabrous or slightly pubescent. Odour and taste very similar to those of Alexandrian Senna.

Chemistry.—These leaflets contain more gummy matter than is found in Alexandrian Senna, and are said to yield a smaller percentage of cathartic acid (·6 per cent).

B.P. Preparations.

May be used in place of Alexandrian Senna.

LAUROCERASI FOLIA.—Cherry-Laurel Leaves.—The fresh leaves of Prunus Laurocerasus.

N.O.—Rosaceæ.

Habitat.—Britain, etc.

Characters.—Thick, coriaceous, on strong, short petioles, oblong, or somewhat obovate, five to seven inches long, tapering towards each end, recurved at the apex, distantly but sharply serrated, and slightly revolute at the margins, dark-green, smooth, and shining above, much paler beneath, and with a prominent mid-rib, on either side of which, towards the base, are one or two glandular depressions. Inodorous except on bruising, when they emit a ratafia-like odour.

Chemistry.—A glucoside, *laurocerasin* is present, and the leaves when distilled yield sugar, volatile oil (benzaldehyde), and hydrocyanic acid. Laurocerasin is similar to but not identical with amygdalin (*see* Amygdala). It is said that the leaves contain the volatile oil ready formed.

Uses, etc.—As a source of cherry-laurel water.

B.P. Preparation.

Aqua Lauorocerasi, containing one-tenth per cent. of HCN.

HAMAMELIDIS FOLIA.—Hamamelis leaves.—The dried leaves of Hamamelis Virginica.

N.O.—Hamamelideæ.

Syn.—Witch Hazel Leaves.

Habitat.—N. America.

Characters.—Short-petiolate, about four inches long, obovate or oval, slightly heart-shaped and oblique at the base, serrate-toothed, nearly smooth; the odour faint, tea-like; taste, astringent and bitter.

Chemistry.—Tannin and a trace of volatile oil.

Uses, etc.—Astringent.

B.P. Preparation.

Extractum Hamamelidis Liquidum - - - 1 in 1.

Note.—Hamamelin, a powdered extractive, and a distilled extract (*hazeline*) containing the volatile oil, are also prepared from the leaves.

EUCALYPTI FOLIA.—Eucalyptus Leaves.—The dried leaves of Eucalyptus globulus.

N.O.—Myrtaceæ.

Syn.—Blue-Gum Tree.

Habitat.—Australia, Tasmania, etc.

Characters.—If obtained from young plants, the leaves are opposite, shortly petiolate, broadly oval or oblong, rather obtuse, heart-shaped at the base, and of a pale, bluish-green colour. The leaves from older trees are alternate, petiolate, lanceolately scythe-shaped, or oval-lanceolate, oblique at the base, very entire, and above gradually tapering to the acute apex. They are six to twelve inches in length, are thick, coriaceous, and of a pale, yellowish-green colour, containing numerous pellucid oil-glands and have, besides the prominent mid-rib, two lateral veins near the margin. Odour peculiar, strong, and balsamic ; taste aromatic, bitterish, and pungent, and followed by a sensation of coolness.

Chemistry.—Volatile oil, tannin, fat and resin.

Uses, etc.—The fresh leaves are one of the officially named sources of Oleum Eucalypti B.P (*q.v.*). The dried leaves are official in the U.S.P. for the production of a fluid extract, and the B.P.C.F. has a rectified spirit tincture, 1 in 5.

Note.—The Eucalyptus genus is a characteristic feature of Australian landscapes. There are about 150 described species, all evergreens, and most of them large trees. When grown in miasmatic districts they are reputed to purify the atmosphere. The leaves yield 2·75 per cent. of oil when fresh, and 6 per cent. when recently dried, but by keeping the leaves the percentage of oil decreases.

MYRCIÆ FOLIA.—Bay Leaves.—The leaves of Myrcia acris.

N.O.—Myrtaceæ.

Habitat.—West Indies.

Syn.—Wild clove leaves.

Characters.—Opposite, three to five inches long ; very coriaceous, lanceolate, obtuse, wavy, somewhat revolute at the edges, with numerous parallel nerves, reticulated on the upper surface, and sprinkled with pellucid dots ; fragrant odour, and somewhat astringent taste.

Chemistry.—Volatile oil, containing eugenol.

Uses, etc.—For the production of the volatile oil which is an ingredient of the so-called "*bay rum.*"

CHEKAN.—Chequen.—The leaves of Myrtus Chekan.

N.O.—Myrtaceæ.

Habitat.—Chili.

Characters.—Nearly sessile, oval-lanceolate or elliptic, about one inch long, with somewhat revolute margin ; light-green, smooth, delicately wrinkled, pellucid-punctate, aromatic.

Chemistry.—Contains volatile oil, tannin, and four principles, viz :—*chekenon*, *chekenin*, *chekenetin*, and *cheken-bitter*.

Uses, etc.—In chronic bronchitis, etc. *Dose.*—30-60 grains in fluid extract.

CONII FOLIA.—Hemlock Leaves.—The fresh leaves and young branches of Conium maculatum; gathered from wild British plants when the fruit begins to form.

N.O.—Umbelliferæ.

Syn.—Cicutæ folia, Cigue feuille.

Habitat.—Britain.

Characters.—More or less divided in a pinnate manner, the lower leaves decompound and sometimes two feet in length, glabrous, and arising from a smooth stem, which is marked with dark purple spots, by clasping petioles of various lengths, those of the lower leaves being hollow. Odour strong and very disagreeable, more especially when rubbed with solution of potash. The leaves are of a dark shining green, and the segments wedge-shaped and tipped at the apex with a lighter coloured spot. If the inflorescence is present, the general and partial involucres should be sought for. Rubbing with solution of potash sets free the alkaloid conine.

Chemistry.—The leaves contain small quantities of the three alkaloids, *conine* ($C_8H_{17}N$), *methyl-conine* ($C_9H_{19}N$), *conhydrine* ($C_8H_{17}NO$). A trace of volatile oil is also present with albumin, mucilage, etc., and about 12 per cent. of ash. Conine is a volatile, yellowish, oily liquid of s.g. ·862, of a peculiar, mousy smell. It is freely soluble in alcohol, ether, fixed and volatile oils, and but slightly so in water. Chemically, it has been shown to be a pyridine derivative.

Note.—The leaves lose much of the alkaloid by drying, and the extract has been shown to be very variable, and consequently unreliable, on account of a similar loss during its manufacture.

Uses, etc.—Externally and internally as an anodyne. *Dose.*—2-8 grains in powder. Said to have been the State poison of the Greeks.

B.P. Preparations.

Cataplasma Conii.
Extractum Conii - from expressed juice, yield about 4 per cent.
Succus Conii.
Unguentum Conii - 2 in 1.
Vapor Coninæ.

Note.—Adulterations and Substitutions.—The following Umbelliferous plants have been noticed:—

1. Œnanthe crocata (*The Water-Dropwort*).—The root is tuberculated; the juice becomes yellow when exposed to the air; the fruit is much longer than that of Conium, more cylindrical, and has two long persistent styles.

2. Æthusa Cynapium (*Fools' Parsley*).—An annual garden weed. It has no general nvolucre, and the partial involucre consists of two to three linear pendulous bracts. The ridges of the cremocarp are not wavy, and the stem has no purple spots.

3. Chærophyllum temulmum (*Rough Chervil*). This plant has a rough spotted stem and swollen joints. The lower leaves are pubescent or ciliated, and the fruits are one-quarter of an inch long, and linear-oblong, and have five obtuse ribs, with vittæ between them.

4. Cicuta virosa (*Cowbane*).—Has a præmorse root; the leaflets are lanceolate and sharply serrate, and the cremocarps are globular.

HYDROCOTYLE.—Indian Pennywort.—The leaves of Hydrocotyle Asiatica.

N.O.—Umbelliferæ.

Habitat.—Tropical Asia and Africa.

Characters.—The leaflets are petiolate, reniform, crenate, seven-nerved, and glabrous, or nearly so.

Chemistry.—An oily volatile liquid, *vellarin* (1 per cent.) and tannic acid.

Uses, etc.—Employed by the natives as an alterative tonic; included in the Indian Pharmacopæia, where it is prescribed in powder or as a poultice for application to syphilitic ulcers.

Note.—The European variety (HYDROCOTYLE VULGARIS) is not unlike this, but has orbicular and peltate leaves.

UVÆ URSI FOLIA.—Bearberry Leaves.—The dried leaves of Arctostaphylos Uva-ursi. From indigenous plants.

N.O.—Ericaceæ.

Syn.—Arbutus Uva-ursi.

Habitat.—Britain.

Characters.—Very shortly stalked. Obovate or spathulate, coriaceous, from half-an-inch to about three-fourths of an inch long, smooth and shining on the upper surface, paler coloured and minutely reticulated beneath; margins entire and slightly revolute. Odour faintly tea-like when powdered; taste very astringent. The infusion gives a bluish-black precipitate with perchloride of iron.

Chemistry.—Tannin 6-7 per cent., gallic acid, *arbutin* ($C_{24}H_{32}O_{14}$, a crystalline glucoside), *ericolin* and *ursone.* Arbutin is bitter, soluble in alcohol and hot water, decomposed by acids into glucose and hydroquinone. Ericolin, a frequent constituent of Ericaceous plants, is similarly decomposable into glucose and *ericinol.*

Uses, etc.—Astringent, tonic, and diuretic. *Dose.*—10-30 grains in powder.

B.P. Preparations.

Infusum Uvæ Ursi - - - - - - - - - - 1 in 20.

Preparations other than B.P.—Solid and fluid extract U.S.P.

Note.—ALLIED SPECIES.—*Manzanita*, the leaves of ARCTOSTAPHYLOS GLAUCA, from California, are employed like uva ursi. They are petiolate, ovate-oblong, about two inches long, usually acute above and obtuse at base, glaucously pale green; inodorous, astringent, and somewhat bitter. They contain arbutin, etc. The leaves of ARC. POLIFOLIA (from Mexico), ARC. TOMENTOSA (*madrona*) are also used in medicine.

ADULTERATIONS AND SUBSTITUTIONS.—The leaves of the *box tree* (BUXUS SEMPERVIRENS. *N.O.*—Euphorbiaceæ) are oval and emarginate at the apex, and have the epidermis loose and separable on the under surface of the leaf. They are devoid of astringency, and an aqueous infusion gives little or no precipitate with ferric chloride solution.

The leaves of the *red whortleberry tree* (VACCINIUM VITIS-IDÆA. *N.O.*—Vacciniaceæ) are minutely crenate and revolute, and the margins are dotted on the under surface. They are but very slightly astringent.

CHIMAPHILA.—Pipsissewa.—The leaves of Chimaphila umbellata.

N.O.—Ericaceæ.

Syn.—Pyrola umbellata.

Habitat.—Europe, Asia, and North America.

Characters.—About two inches long, oblanceolate, sharply serrate above, wedge-shaped and nearly entire at the base; coriaceous, smooth and dark-green on the upper surface. It is nearly inodorous, and has an astringent and bitterish taste.

Chemistry.—Bitter extractive, *chimaphilin*, arbutin, a resin, and tannic acid (14 per cent.)

Uses, etc.—Astringent, diuretic, etc. *Dose.*—15-60 grains. Official in the U.S.P. for the production of a fluid extract.

Note.—CHIMAPHILA is also sometimes known under the name of wintergreen; hence the erroneous application of the name of Ol. Pyrolæ to Oil of Wintergreen.

GAULTHERIA.—Wintergreen.—The leaves of Gaultheria procumbens.

N.O.—Ericaceæ.

Habitat.—Canada and United States of America.

Characters.—Short-petiolate, obovate or roundish oval, about one and a half inches long, three-quarters of an inch or more broad, mucronate, slightly serrate, with adpressed teeth; coriaceous, smooth, glossy-green above, pale beneath; odour fragrant; taste aromatic and astringent.

Chemistry.—Volatile oil (0·5 per cent.), which consists chiefly of salicylate of methyl $C_6H_4(OH)COOCH_3$, S.G. 1·175. Tannic acid, gallic acid, arbutin, ursone, and ericolin, are also present.

Uses, etc.—Stimulant, diuretic, etc. *Dose.*—15-60 grains. Formerly official in the United States; the volatile oil only is now included in the U.S.P.

Note.—*Oil of Wintergreen* differs from *Oil of Birch* (from the bark of BETULA LENTA) in containing a small quantity of terpene (*gaultheriline*) in addition to the salicylic ester Oil of Birch is, however, said to be sold indiscriminately either alone or mixed with the oil from Gaultheria under the name of Oil of Wintergreen. Large quantities of methyl salicylate are produced synthetically.

LEDUM.—Ledum.—The leaves of Ledum palustre.

N.O.—Ericaceæ.

Syn.—Marsh tea.

Habitat.—North Europe, etc.

The leaves of this evergreen shrub contain tannin, volatile oil, ericolin, ericinol, resin, etc., and have been employed in dysentery and in cutaneous diseases.

Note.—*Labrador Tea* is the leaves of LEDUM LATIFOLIUM, from Canada. Its properties are similar to those of the above.

BELLADONNÆ FOLIA.—Belladonna Leaves.—The fresh leaves, with the branches to which they are attached, of Atropa Belladonna; also the leaves separated from the branches and carefully dried. Gathered when the fruit has begun to form, from plants growing wild or cultivated in Britain.

N.O.—Solanaceæ.

Habitat.—Britain.

Characters.—Leaves alternate below, in pairs above, of unequal size, all shortly stalked, from three to eight inches long, broadly ovate, acute, entire, smooth. The expressed juice of the fresh leaves, or an infusion of the dried leaves dropped into the eye dilates the pupil. The dried leaves are thin and papery, of a light colour, and frequently have circular perforations.

Chemistry.—*Atropine* and *hyoscyamine* ·3 to ·8 per cent. (*see* Belladonna root). The amount of alkaloids present varies somewhat according to whether the leaves are from wild or from cultivated plants, and largely according to the methods of drying and storing adopted. Malic acid, mucilage, wax, albumin, etc., are also present.

Uses, etc.—Anodyne, diuretic, narcotic; in large doses dilates the pupil. *Dose.*—½-3 grains.

B.P. Preparations.

Extractum Belladonnæ -	from expressed juice, yield about 4 per cent.
Succus Belladonnæ - -	
Tinctura Belladonnæ - -	1 in 20 of proof spirit.

Note.—The above preparations are very variable in point of alkaloidal value, there being at present no official standard of strength.

Preparations other than B.P.—Glycerinum Belladonnæ B.P.C. (from extract, 1 in 2).

Note.—ADULTERATIONS AND SUBSTITUTIONS.—Care should be exercised in the examination of these leaves, for sometimes digitalis, hyoscyamus, verbascum, and stramonium leaves are found amongst them. The entire margin of belladonna leaves is the most useful distinguishing characteristic.

STRAMONII FOLIA—Stramonium Leaves.

The dried leaves of Datura Stramonium.

N.O.—Solanaceæ.

Syn.—Thorn-apple.

Habitat.—Britain.

Characters.—They stand on short, round petioles in the forks of the stems; five to six inches long, .smooth, of an ovate-triangular form, irregularly sinuated and toothed at the edges, unequal at the base, dark green on the upper surface and pale beneath; when fresh they emit a fœtid, narcotic odour, which is lost on drying; taste bitter and nauseous. After drying, thin and brittle; the taste of bitterness is retained if the leaves are carefully dried.

Chemistry.—*Daturine*, said to be a mixture of atropine and hyoscyanine, ·3 to ·4 per cent. Mucilage, albumin, and ash (17 per cent.) are also present.

Uses, etc.—For purposes similar to those for which Belladonna is used. Much employed in asthma powders, and as an ingredient of medicinal cigarettes.

Note.—DATURA TATULA is very similar, but has leaves of a deep green, and stems and flowers of a purple colour.

HYOSCYAMI FOLIA.—Henbane Leaves.

The fresh leaves and flowers, with the branches to which they are attached, of Hyoscyamus niger; also the leaves separated from the branches and flowering tops, carefully dried. Collected from biennial plants growing wild or cultivated in Britain, when about two-thirds of the flowers are expanded.

N.O.—Solanaceæ.

Habitat.—Britain.

Characters.—Leaves varying in length, sometimes as much as ten inches, with or without a stalk, alternate, triangular-ovate, or ovate-oblong, acute, undulated, irregularly toothed, sinuated, or pinnatifid, pale green and glandular hairy, particularly on their under surface. The branches are sub-cylindrical, and also glandular-hairy. The fresh herb has a strong heavy odour, a bitter and slightly acrid taste, and the juice when dropped into the eye dilates the pupil.

In the dry state the official leaves are in nodules, having flowers amongst them, which are easily recognized by the light-coloured corollas, marked with purple reticulated veins. The leaves of the first year of the biennial plant are radical and stalked. Annual henbane has shorter leaves, and primrose-coloured flowers, with few purple streaks, and the whole plant is less hairy, and of a lighter colour.

Chemistry.—The alkaloid *hyoscyamine* ($C_{17}H_{23}NO_3$) is present to the extent of ·04 to 0·06 per cent. of the dried leaf. There are also present a second alkaloid, *hyoscine* ($C_{17}H_{21}NO_4,H_2O$), a glucoside *hyoscypicrin*, mucilage, albumin, etc. Hyoscyamine is isomeric, but not identical, with atropine (for means of distinguishing the two alkaloids, see p. 41). Hyoscine is identical with scopolamine, the alkaloid obtained from Scopolia.

Note.—Formerly the second year's growth of the biennial plant was thought to contain a considerably larger percentage of alkaloid than either the first year's growth of the same plant or the annual plant, but it is now held that leaves from English grown species of all of the above are practically of equal alkaloidal value; the German imported drug is however of much less value.

Uses, etc.—Similar to Belladonna and Stramonium, but milder in proportion.

B.P. Preparations.

Extractum Hyoscyami - -	from expressed juice; yield 4½-5½ per cent.
Succus Hyoscyami - - -	
Tinctura Hyoscyami - - -	1 in 8 of proof spirit.

Note.—The sulphate of hyoscyamine is included in the U.S.P.; it is crystalline and readily soluble in water. The hydrobromates of hyoscyamine and of hyoscine are included in the Pharmacopœias of the U.S., etc,

TABACI FOLIA.—Tobacco Leaves.—The dried leaves of Nicotiana Tabacum.

N.O.—Solanaceæ.

Habitat.—America; cultivated.

Characters.—Large, being sometimes more than twenty inches long; ovate-lanceolate or oval oblong, acute, entire, brown, brittle, glandular-hairy; having a characteristic odour and nauseous, bitter, acrid taste; yielding, when distilled with solution of potash, an alkaline fluid which has the peculiar odour of nicotine, and precipitates with perchloride of platinum and tincture of galls.

Chemistry.—A colourless, liquid, volatile alkaloid, *nicotine* ($C_{10}H_{14}N_2$), with an acrid odour, and an acrid burning taste, is the most important constituent. There are also present a white crystalline, volatile body *nicotianin* (the chemical nature of which is not yet properly understood), albumin, resin, gum extractive, citric and malic acids, and a large amount of ash (14-20 per cent.) Nicotine has S.G. 1·011, is inflammable, soluble in water, ether, alcohol, and the fixed oils; it is powerfully poisonous. The alkaloid is not present in the fumes of burning tobacco.

Uses, etc.—Tobacco is but little used in medicine; an infusion is made use of as an insecticide.

DUBOISIA.—Duboisia.—The leaves of Duboisia myoporoides.

N.O.—Solanaceæ.

Habitat.—N. S. Wales and Queensland.

Characters.—Shortly petiolate, lanceolate, three to four inches long, three-fifths to one inch broad, narrowed at both ends, entire, mid-rib prominent, margin revolute; thin, smooth, inodorous, bitter.

Chemistry.—The alkaloid *duboisine* is present, with resin, albumin, etc. Duboisine is a mydriatic alkaloid, probably a mixture of hyoscyamine and hyoscine.

Uses, etc.—As Belladonna, Stramonium, etc. The sulphate of the alkaloid finds occasional use in medicine.

DIGITALIS FOLIA.—Foxglove Leaves.—

The leaves of Digitalis purpurea. Collected from wild British plants of the second year's growth when about two-thirds of the flowers are expanded, and carefully dried.

N.O.—Scrophulariaceæ.

Habitat.—Britain.

Characters.—From four to twelve or more inches in length, and sometimes as much as five or six inches broad, with a winged petiole of varying length; ovate or ovate-lanceolate, subacute, crenate or irregularly crenate-dentate, somewhat rugose, slightly hairy and dull-green above. Densely pubescent and paler beneath. Taste very bitter, unpleasant; odour faint, agreeable, and tea-like.

Chemistry.—There are present at least five principles, viz.:—*digitonin*, a substance allied to saponin; *digitalin* (Schmiedeburg), a glucoside decomposable into *digitaliretin* and glucose, or according to Kiliani into *digitaligenin*, glucose, and *digitalose*; *digitalein*; *digitoxin*, which is crystalline, not a glucoside, and yields *toxiresin* when treated with dilute acids; and *digitin*, also crystallizable. Of these, digitalin (Schmiedeburg) and digitoxin are the most active, the former possessing the most useful medicinal characteristics of Digitalis. Digitoxin and its decomposition product toxiresin are highly poisonous, and said to be uncertain and dangerous in their action. Digitonin and digitin are said to be inert. Digitalin (Schmiedeburg) is soluble in alcohol, almost insoluble in water, sparingly soluble in ether and chloroform.

Uses, etc.—As cardiac tonic, etc. *Dose.*—$\frac{1}{2}$-1$\frac{1}{2}$ grains in powder.

B.P. Preparations.

Infusum Digitalis - - - -	1 in 156.
Tinctura Digitalis - - - -	1 in 8 of proof spirit.

DIGITALIN.—Under this name at least four different substances occur in commerce, no one of which can safely be said to represent the drug from which it is obtained, or to be fully reliable in its action, viz.:—

1. *French Digitalin*—the amorphous product of Homolle. This was formerly official in the B.P. and is said to be made up of a mixture of digitalin and digitoxin.
2. *Nativelle's Digitalin.*—This is the crystalline substance claimed by Nativelle to be the active principle of Digitalis, and for the isolation of which he obtained the prize of the French Academy. It is said to consist of digitoxin with some digitalin.
3. *German Digitalin* is an amorphous substance soluble in water, and is said to consist chiefly of digitalein.
4. *Digitalin Verum.*—This is the name applied to the digitalin of Schmiedeburg; it is a white amorphous powder, and is said to consist entirely of digitalin; for this reason it is regarded as being the most reliable of the different substances bearing the name digitalin.

Note.—ADULTERATIONS OF DIGITALIS LEAVES.—*Ploughman's spikenard*, the leaves of INULA CONYZA, are rougher, less divided on their margins, and when bruised emit a fœtid odour.

Comfrey leaves (SYMPHYTUM OFFICINALE).—The smaller veins do not extend into the wing of the petiole.

Great Mullein leaves (VERBASCUM THAPSUS) possess a woolly appearance on both sides, whereas the foxglove leaves are much less downy and on the upper surface only.

LAURI FOLIA.—Sweet Bay Leaves.—The leaves of Laurus nobilis.

N.O.—Laurineæ.

Habitat.—The Mediterranean shores.

Characters.—Three to four inches long, an inch or more broad, shortly petiolate, coriaceous, smooth, pellucid-punctate, oblong, or oblong-lanceolate, acute at both ends, entire, glossy above, veined beneath, and when dry of a yellowish or brownish-green colour, pleasant aromatic odour, and and bitterish taste.

Chemistry.—By distillation a yellow-coloured volatile oil is obtained, having a S.G. of 0·91, and consisting of a mixture of hydrocarbons.

Uses, etc.—The volatile oil finds use as an ingredient of external applications for the skin, etc.

MATICÆ FOLIA.—Matico Leaves.—The dried leaves of Piper angustifolium (Artanthe elongata).

N.O.—Piperaceæ.

Habitat.—Peru.

Characters.—From about four to eight inches long, oblong-lanceolate, tapering towards the apex, cordate and unequal at the base, entire or minutely crenulate, greenish-yellow, very shortly petiolate, reticulated with sunken veins and tesselated above, the veins prominent beneath, and the depressions formed by them densely clothed with hairs. Taste aromatic, bitterish; odour pleasant, feebly aromatic. The leaves as commonly seen in commerce are more or less broken, folded, and compressed into a brittle mass, and have mixed with them a variable proportion of the jointed stems, flowers and fruit.

Chemistry.—A small quantity of volatile oil; a crystallisable acid, called *artanthic acid;* a trace of tannic acid; and a little resin.

Uses, etc.—Aromatic, tonic and stimulant; the volatile oil has a styptic action. *Dose,* in powder.—30-120 grains.

B.P. Preparation.

Infusum Maticæ - - - - - - - - - 1 in 20.

Note.—The U.S.P. includes a fluid extract and a tincture (1 in 5).

ROSMARINUS.—Rosemary.—The leaves of Rosmarinus officinalis.

N.O.—Labiatæ.

Habitat.—Basin of the Mediterranean.

Characters.—About one inch long, rigid, linear, entire, revolute, dark-green above, woolly and glandular beneath; pungently aromatic, somewhat camphoraceous.

Chemistry.—Volatile oil (0·5 to 1 per cent.), a little tannic acid, resin and bitter principle.

Uses, etc.—For the production of the oil (*see* Oleum Rosmarini).

THYMUS.—Thyme.—The leaves of Thymus vulgaris.

N.O.—Labiatæ.

Habitat.—Europe; cultivated.

Characters.—The leaves are one-quarter to one-third of an inch long, ovate-oblong or linear, revolute margins, greyish-green, glandular, punctate on both sides, and pubescent beneath, the upper ones bearing in their axils small clusters of whitish, or reddish flowers, with exserted stamens.

Chemistry.—Volatile oil, about 2½ per cent. The oil contains cymene ($C_{10}H_{14}$), *thymene* ($C_{10}H_{16}$), and *thymol* ($C_{10}H_{14}O$). *See* Thymol.

Uses, etc.—For the production of Oil of Thyme and thence of Thymol. Commercial Oil of Thyme is frequently sold under the name of Oil of Origanum, and is not infrequently more or less destitute of thymol.

Note.—*Wild thyme* (THYMUS SERPYLLUM) has similar properties to the above, and has been used in medicine as a stimulant and carminative.

SALVIA—Sage.—The leaves of Salvia officinalis.

N.O.—Labiatæ.

Habitat.—Indigenous to Southern Europe.

Characters.—About two inches long, petiolate, ovate-oblong, obtuse, finely crenulate, thickish, wrinkled, greyish-green, soft, hairy, and glandular beneath; aromatic, bitterish, somewhat astringent.

Chemistry.—Yields volatile oil 0·15 to 0·25 per cent. when fresh, or about three times this quantity when dry. The S.G. of this is between 0·86 and 0·93.; it contains terpenes and *salviol* ($C_{10}H_{18}O$). Tannin and resin are also present in the leaves.

Uses, etc.—Stimulant, astringent; official in the U.S.P. *Dose.*—15-60 grains in infusion.

BOLDO.—The leaves of Pneumus Boldus (Boldoa fragrans).

N.O.—Monimiaceæ.

Syn.—Boldu.

Habitat.—Chili.

Characters.—Opposite, shortly petiolate or sessile, about two inches long, entire, reddish-brown when dry, coriaceous, with a prominent midrib and very numerous small glands on the surface; odour fragrant; taste aromatic and pungent.

Chemistry.—Contains an aromatic volatile oil (2 per cent.), a glucoside *boldine* (0·1 per cent.), resin, tannin, etc.

Uses, etc.—Stimulant, hypnotic. The French Codex includes a 1 in 5 tincture.

OLEANDER.—Oleander.—The leaves of Nerium Oleander.

N.O.—Apocynaceæ.

Syn.—Laurien Rose.

Habitat.—Basin of the Mediterranean.

Characters.—Nearly sessile, linear-lanceolate, four inches long, finely pointed, somewhat revolute, smooth, glossy above, feather-veined; inodorous, bitter, nauseous.

Chemistry.—*Neriin* (allied to digitalin), and a glucoside, *oleandrin.*

Uses, etc.—As cardiac tonic, etc.

ILEX PARAGUAYENSIS.—Paraguay Tea.—The leaves of Ilex Paraguayensis.

N.O.—Ilicineæ.

Syn.—Maté.

Habitat.—Brazil.

Characters.—Short-petiolate, lanceolate-oblong, about two inches in length, nearly obtuse, margin dentate; odour slight; taste bitter and astringent. Usually met with in commerce in the form of a highly-dried coarse powder.

Chemistry.—Tannin (10-16 per cent.), caffeine ($\frac{1}{4}$-$1\frac{1}{2}$ per cent.), volatile oil, fat, etc.

Uses, etc.—Similar to those of the other caffeinic drugs.

DAMIANA.—Damiana.—The leaves of Turnera microphylla

N.O.—Turneraceæ.

Habitat.—Mexico.

Characters.—Short petiolate, obovate or obovate-lanceolate, about one inch long, somewhat obtuse, with a wedge-shaped base and widely dentate margin, light green, smooth. Odour and taste aromatic.

Chemistry.—Volatile oil, resins and a bitter substance.

Uses, etc.—As tonic, diuretic and aphrodisiac. Prescribed in extract and fluid extract. *Dose.*—30 grains.

Note.—False Damiana is said to be the leaves of HAPLOPAPPUS DISCOIDEUS (*N.O.*—Compositæ). These are distinctly lanceolate and have only two or three teeth on each side.

CASTANEA.—Chestnut.—The leaves of Castanea dentata, collected in September or October whilst still green.

N.O.—Cupuliferæ.

Habitat.—Europe, etc.

Characters.—From six to ten inches long, about two inches in width, petiolate, oblong-lanceolate, acuminate, mucronate, feather-veined, sinuate-serrate, smooth; odour slight; taste astringent.

Chemistry.—Tannin, etc.

Uses, etc—Tonic, sedative. *Dose.*—30-120 grains. Official in the U.S.P. for the production of a fluid extract.

ERIODICTYON.—Eriodictyon.—The leaves of Eriodictyon glutinosum.

N.O.—Hydrophyllaceæ.

Syn.—Mountain balm, Jerba santa.

Habitat.—California.

Characters.—Oblong-lanceolate, two to four inches long, acute at the apex, and below narrowed into a short petiole, the margin sinuately toothed to nearly entire; upper surface green, smooth, and covered with a brownish resin; lower surface reticulate and minutely white, tomentose; odour aromatic, taste balsamic, sweetish.

Chemistry.—Resins, tannin, etc.

Uses, etc.—As expectorant. *Dose.*—30-60 grains. Official in the U.S.P. for the production of a fluid extract.

MENYANTHES.—Buckbean.—The leaves of Menyanthes trifoliata.

N.O.—Gentianaceæ.

Syn.—Bogbean.

Habitat.—Europe, etc.

Characters.—The leaves are on petioles, four to six inches long, alternate; the leaflets are sessile, about two inches long, obtuse-oblong or obovate, the margin is slightly crenate, smooth and pale green. They are inodorous, and have a very bitter taste, free from astringency.

Chemistry.—A small quantity of volatile oil, *menyanthin* (a bitter substance), starch, and a little tannic acid. The bitterness is imparted to both alcohol and water.

Uses, etc.—Tonic and cathartic. *Dose.*—15-45 grains in preparations. Two ounces of dried leaves are said to be equivalent to one pound of hops for brewing purposes.

RHUS TOXICODENDRON.—Poison Oak.—The fresh leaves of Rhus toxicodendron and Rhus radicans.

N.O.—Anacardiaceæ.

Syn.—Poison ivy.

Habitat.—Canada.

Characters.—Long-petiolate, trifoliate; the lateral leaflets sessile, about four inches long, obliquely-ovate, pointed; the terminal leaflets stalked, ovate or oval, pointed, with a wedge-shaped base; the leaflets entire and glabrous (in Rhus radicans) or variously notched, coarsely toothed or lobed, downy beneath (in Rhus toxicodendron). When dry, papery and brittle; inodorous; astringent and acid.

Chemistry.—*Toxicodendric acid*, tannin, fixed oil, etc.

Uses, etc.—Irritant, rubefacient. *Dose.*—2-5 grains; official in the U.S.P. Usually given in tincture (Tinctura Rhois).

Note.—The fresh leaves abound with an acrid juice, which darkens when exposed to air, and when applied to the skin produce inflammation and swelling. They, therefore, require to be handled cautiously when fresh. The leaflets of PTELEA TRIFOLIATA (*N.O.*—Rutaceæ) are sessile.

RUMEX ACETOSA.—Sorrel.—The leaves of Rumex acetosa.

N.O.—Polygonaceæ.

Syn.—Green sauce.

Habitat.—Britain.

Characters.—Alternate, oblong-sagittate, smooth on both sides, undulated at the margin; bright-green, lowermost petiolate-obtuse, with two lobes at the base turned backwards, upper smaller, sessile, acute; uppermost linear; the whole subtended by membranous, whitish, semi-tubular, scarious stipules.

Chemistry.—Tartaric and tannic acids are present, together with acid oxalate of potassium.

Uses, etc.—Refrigerant and diuretic; formerly included in some of the Pharmacopœias.

TYLOPHORÆ FOLIA.—Tylophora Leaves.—The dried leaves of Tylophora asthmatica.

N.O.—Asclepiadaceæ.

Syn.—Indian Ipecacuanha.

Habitat.—India.

Characters.—From two to three inches long, entire, ovate-acuminate, cordate at the base, glabrous above, downy beneath. They have a heavy disagreeable smell when bruised, and a nauseous taste.

Chemistry.—The alkaloid *tylophorine*, which has been found in the root of this plant, is also probably present in the leaves.

Uses, etc.—Official in India as a substitute for Ipecacuanha.

6. FLOWERS.—FLORES.

UNDER this heading are included not only flowers proper, but parts of flowers (saffron) and groups of flowers or *inflorescences* (chamomile, cusso). The inflorescence most commonly met with is the so-called *head* or *capitulum* of the Compositæ which consists of a globular cluster of sessile florets, some of which are usually modified for purposes other than that of reproduction, and surround the sexual flowers in a circle called the *ray*. The capitulum is usually bounded at its base by a number of scale-like leaves or *bracts* forming the *involucre*, whilst scattered amongst the florets are many similar but smaller scales, the *paleæ* or *chaff*.

The flower, which may be stalked (*pedunculate*) or stalkless (*sessile*), normally consists of the male and female reproductive organs of the plant (*stamens* and *pistil*), surrounded by two whorls of protective envelopes (*corolla* and *calyx*), the whole being borne on a more or less disc-like structure, the *thalamus* or *receptacle*. The stamen, consists normally of the thread-like *filament*, carrying at its summit the *anther*, which bears the *pollen grains* or ultimate male elements. The pistil consists of one or more vessels (*carpels*) constituting the *ovary* and carrying the ultimate female element or ovule; whilst attached to the ovary, either directly or by means of a thread-like prolongation (the *style*) is the pollen-receiving organ or *stigma*. The inner surrounding envelope or corolla of the flower is made up of a number of leaf-like, usually more or less brightly-coloured parts, the *petals*, whilst the outer envelope or *calyx* is similarly constituted, but is usually green in colour. The duration of both corolla and calyx is various, the terms *persistent*, *deciduous*, etc., having here the same significance as in the case of leaves, *e.g.*, the calyx of Labiates commonly remains unwithered until the fruit is matured, whilst that of some Papaveraceæ (corn-poppy) falls when the corolla unfolds.

The typical flower has the complete number of organs enumerated above, and these equal in number and alike in shape; but in the majority of cases there are to be found wide deviations from the typical arrangement. Various modifications are brought about by, *e.g.*—the union of members of the same whorl (*gamopetaly*, *gamosepaly*, etc.) or of members of contiguous whorls (*epipetalous* stamens); the suppression of some parts, as in flowers having calyx only, corolla only, etc.; irregularity in size or shape of members of the same circle; the existence of an increased number of members of the same circle, etc. Diœcious flowers, *i.e.*, flowers in which the male and female organs are borne in different individuals, are also not infrequently met with.

RHŒADOS PETALA.—Red-Poppy Petals.

The fresh petals of Papaver Rhœas. From indigenous plants.

N.O.—Papaveraceæ.

Syn.—Corn Poppy.

Habitat.—Europe, N. Africa, and Asia eastward to India.

Characters.—Of a bright scarlet colour, often nearly black at the base, unequal in size, with a strong narcotic odour, and slightly bitter taste.

Chemistry.—They do not contain morphine, but *rhœadine* ($C_{21}H_{21}NO_6$), a non-toxic alkaloid; gum, starch, albumin, fat, wax, and two deliquescent colouring principles, *rhœadic acid* (dark red) and *papaveric acid* (bright red) are also present.

Uses, etc.—Chiefly as a colouring agent.

B.P. Preparation.

Syrupus Rhœados - - - - - - - - - 1 in 3½.

CUSSO.—Kousso.

—The dried panicles (chiefly of the female flowers) of Hagenia abyssinica (Brayera anthelmintica).

N.O.—Rosaceæ.

Habitat.—Abyssinia.

Characters.—In compressed clusters or more or less cylindrical rolls, usually ten inches or more in length, or the panicles are broken up into small fragments; brownish or greenish-brown, or reddish in the case of the female flowers; odour herby, tea-like; taste bitter, acrid, and disagreeable. The separate panicles are much branched, zigzag, more or less covered with hairs and glands, and with a large sheathing bract at the base of every branch. Flowers numerous, small, shortly-stalked, unisexual, with two roundish membranous veiny bracts at the base of each flower, which are brownish-yellow in the male, and tinged with red in the female flowers; calyx hairy externally, veiny, with ten segments in two alternating whorls.

Chemistry.—Contains *koussin* (*kosin*) 3 per cent., tannic acid (24 per cent.), wax, gum, sugar, and 6·25 per cent. of an acrid resin. Kosin is yellowish, amorphous or crystalline, tasteless, pearly, insoluble in water, soluble in alkalies, ether, alcohol, etc.

Uses, etc.—As anthelmintic and tænifuge. *Dose.*—¼-½ oz.

B.P. Preparations.

Infusum Cusso - - - - - - - - - - 1 in 16.

ROSÆ CENTIFOLIÆ PETALA.—Cabbage-rose Petals.

—The fresh fully expanded petals of Rosa centifolia. From plants cultivated in Britain.

N.O.—Rosaceæ.

Habitat.—Britain.

Characters.—Large, thin, delicate, very fragrant, and with a sweetish, slightly astringent, bitterish taste. Both odour and taste are readily imparted to water.

Chemistry.—Malic acid, tartaric acid, tannic acid, fat, resin, sugar, mucilage, and volatile oil (*otto of rose*).

Uses, etc.—Chiefly for production of rose water. They may be preserved, when in a fresh state, by the addition of common salt.

B.P. Preparation.

Aqua Rosæ - - - - -	10 pounds to 1 gallon.

ROSÆ GALLICÆ PETALA.—Red-rose Petals.—The fresh and dried unexpanded petals of Rosa gallica. From plants cultivated in Britain.

N.O.—Rosaceæ.

Habitat.—Britain.

Characters.—Usually in little cone-like masses, or sometimes separate and more or less crumpled ; fine purplish-red, retained after drying, velvety ; odour fragrant, roseate, especially developed by drying ; taste bitterish, feebly acrid and astringent.

Chemistry.—Tannic and gallic acids, *quercitrin*, glucose and a trace of volatile oil are present. The colouring matter, which is of an acid nature, is turned green by alkalies.

Uses, etc.—As tonic and mild astringent. *Dose.*—15-60 grains in powder.

B.P. Preparations.

Confectio Rosæ Gallicæ -	1 part of fresh petals in 4.
Infusum Rosæ Acidum -	1 ,, dried ,, in 40.
Syrupus Rosæ Gallicæ -	1 ,, ,, ,, in 17¼.

Note.—The U.S.P. includes a fluid extract (1 in 1) and a honey of roses.

CARYOPHYLLUM—Cloves.—The dried flower-bud of Eugenia caryophyllata (Caryophllus aromaticus).

N.O.—Myrtaceæ.

Habitat.—The Molucca Islands (Amboyna, etc.) ; cultivated in Zanzibar and the West Indies.

Characters.—Over half an inch long, and consisting of a dark-brown wrinkled sub-cylindrical and somewhat angular calyx-tube, which tapers below, and is surmounted by four teeth, between which the paler-coloured petals, enclosing the numerous stamens and style, are rolled up in the form of a ball. Odour strong, fragrant and spicy ; taste very pungent and aromatic. It emits oil when indented with the nail.

Chemistry.—Volatile oil (18 per cent.), *caryophyllin* ($C_{20}H_{32}O_2$, white crystalline, tasteless), *eugenin* ($C_{10}H_{12}O_2$, crystalline, isomeric with eugenol), tannic acid (13 per cent.), gum, resin, etc.

Uses, etc.—Stimulant, carminative. *Dose.*—5-10 grains. Also largely as a flavouring agent in the kitchen, etc.

B.P. Preparations.

Infusum Aurantii Compositum,	56 grains to 1 pint.
,, Caryophylli - - -	1 in 40.
Mistura Ferri Aromatica - -	¼ ounce to 1 fluid ounce.
Oleum Caryophylli.	
Vinum Opii - - - - - - -	75 grains to 1 pint.

OLEUM CARYOPHYLLI, the volatile oil obtained by distilling cloves with water, is colourless or pale yellow when recently distilled, but becomes reddish-brown by keeping. It has S. G. 1·040 to 1·065, and consists of a hydrocarbon ($C_{15}H_{24}$) and a phenol-like body *eugenol* ($C_{10}H_{12}O_2$). Oil of cloves is not infrequently adulterated with fixed oils, oils of pimenta and copaiba, carbolic acid, etc.

The B.P. preparations, Conf. Scammon., Pil. Coloc. co. and Pil. Coloc. et Hyoscy., contain oil of cloves.

Mother cloves, *Anthophylli*, the fruits of the clove-tree, are ovate-oblong berries containing less volatile oil than the true drug. They contain large starch granules, by means of which their presence in ground cloves may be detected.

Royal cloves were certain monstrous cloves having abnormally increased floral envelopes.

Note.—ADULTERATIONS OF CLOVES.—*Clove stalks* contain from 4 to 6½ per cent. of volatile oil, and are used to adulterate ground cloves.

SAMBUCI FLORES.—Elder Flowers.—The fresh flowers of Sambucus nigra. From indigenous plants.

N.O.—Caprifoliaceæ.

Habitat.—Indigenous.

Characters.—In corymbose cymes, from five to seven inches across. Flowers small; calyx superior, five-toothed; corolla flat, rotate, five-sected, creamy-white, with five stamens inserted in the tube. Odour fragrant, but somewhat sickly; taste bitterish. In the dried state they consist of monopetalous corolla and stamens attached; small, of a brownish-yellow colour, with an agreeable odour, and somewhat bitter taste.

Chemistry.—The fragrance of the flowers is due to a little volatile oil, of a butyraceous consistence, and volatile acids.

Uses, etc.—For the production of the distilled water, which is known on the continent as *Eau de Sureau.*

B.P. Preparation.

Aqua Sambuci - - - -	10 pounds to 1 gallon.

Note.—The fresh leaves warmed with fats yield *Oleum Viride* and *Unguentum Viride.* The fresh flowers by infusion in warm lard produce *Unguentum Sambuci Florum;* and the ripe fruit is used to prepare elder-wine, and to impart colour to wines.

ANTHEMIDIS FLORES.—Chamomile Flowers.—The dried single and double flower heads or capitula of Anthemis nobilis. From cultivated plants.

N.O.—Compositæ.

Habitat.—Britain; cultivated.

Characters.—The single chamomile flowers of commerce are those in which the capitula have some yellow tubular florets in the centre, surrounded by a variable number of those which are white and ligulate; the double flowers are those in which all or nearly all the florets are white and ligulate. In both kinds the receptacle is solid, conical, and densely covered with chaffy scales; and both varieties, but especially the single, have a strong aromatic odour and very bitter taste.

Chemistry.—Volatile oil ·75 per cent., resin, tannin (little), and bitter principle of a glucosidal nature.

Uses, etc.—Tonic and stomachic. *Dose.*—15-60 grains.

B.P. Preparations.

Extractum Anthemidis -	aqueous; yield about 30 per cent.
Infusum Anthemidis - -	1 in 20.
Oleum Anthemidis.	

OLEUM ANTHEMIDIS B.P., the volatile oil, is pale-green or blue when freshly distilled, but becomes yellowish on keeping. It has S.G. ·905 to ·915 and consists of a mixture, in varying proportions, of *angelates* and *tiglates* of *amyl* and *butyl*, and probably other esters.

Note.—SUBSTITUTIONS AND ADULTERATIONS.—The capitula of the *wild* or *German chamomile* (MATRICARIA CHAMOMILLA), may be distinguished by having a hollow receptacle, and its florets having no chaff (paleæ) around them. They are also less aromatic than the official kind. The double flowers of *feverfew* [PYRETHRUM (CHRYSANTHEMUM) PARTHENIUM] have the florets arranged on a nearly flat receptacle and the odour is unpleasant.

ARNICÆ FLORES.—Arnica Flowers.—The flower-heads of Arnica montana.

N.O.—Compositæ.

Habitat.—Central Europe.

Characters.—About one and a fifth inch broad, depressed-roundish, consisting of a scaly involucre in two rows, and a small, flat, hairy receptacle, bearing about sixteen yellow, strap-shaped ray-florets, and numerous yellow, five-toothed, tubular disk-florets, having slender, spindle-shaped achenes (cypselæ), crowned by a hairy pappus. It has a feeble, aromatic odour, and a bitter, acrid taste.

Chemistry.—Two volatile oils, several resins, one insoluble in ether, and *arnicin*, which is found also in the rhizome.

Uses, etc.—Similar to the root. Official in the U.S.P. for the production of a tincture.

SANTONICA.—Santonica.—The dried unexpanded flower-heads or capitula of Artemisia maritima, *var.* Stechmanniana (Artemisia pauciflora).

N.O.—Compositæ.

Syn.—Wormseed, Semen contra, Semen cinæ.

Habitat.—Russia.

Characters.—About one-tenth of an inch in length, oblong-ovoid, obtuse, pale greenish-brown, nearly smooth; resembling seeds in appearance, but consisting of from twelve to eighteen imbricated involucral scales with a broad, thick, yellowish-green midrib, enclosing three to five somewhat tubular florets. Odour, more especially when rubbed, strong, peculiar, and somewhat camphoraceous; taste bitter and camphoraceous.

Chemistry.—Volatile oil (1 per cent.) *santonin* (1 to 2 per cent.), resin, sugar, and ash (6·5 per cent.), rich in silica.

Uses, etc. — For making Santonin. An ethereal extract (*Extractum Cinæ*) is official in some of the Continental Pharmacopœias.

B.P. Preparation.—Santoninum.

SANTONINUM, B.P.—Santonin, $C_{15}H_{18}O_3$, the active principle of Santonica, may be obtained by treating the drug with lime and decomposing the compound thus formed with hydrochloric acid. It is obtained in the form of flat rhombic prisms, feebly bitter, fusible and sublimable, sparingly soluble in water, soluble in 40 parts of rectified spirit, in 4 of boiling rectified spirit, and in 2 parts of chloroform. It is not dissolved by dilute mineral acids; leaves no residue when burned with free access of air, and when added to warm alcoholic solution of potash, yields a violet-red colour. Santonin is the anhydryde of *santonic acid* ($C_{15}H_{20}O_4$), and is peculiarly susceptible to the action of sunlight, by which it is decomposed into *photo-santonic acid.* Santonin is largely made use of as an anthelmintic, and lozenges *(Trochisci Santonini)* containing one grain in each are included in the B.P.

Note.—ADULTERATIONS OF SANTONICA.—The unexpanded flower-heads of ARTEMISIA GLOMERATA (*Barbary wormseed*) have generally more of the flower-stalk attached than the Russian, and are covered with minute hairs. This and the East Indian variety are worthless, since they contain no santonin. Those of ARTEMISIA VULGARIS (*mugwort*) and of ARTEMISIA ABSINTHIUM (*which see*) are round.

CALENDULÆ FLORES.—Marigold Flowers.—The florets of Calendula officinalis.

N.O.—Compositæ.

Habitat.—South Europe.

Characters.—Florets about half an inch long, linear and strap-shaped, delicately veined in a longitudinal direction, yellow or orange-coloured, three-toothed above, the short hairy tube enclosing the remnants of a filiform style terminating in two elongated branches; odour slight and somewhat heavy; taste bitterish and somewhat saline.

Chemistry.—See Calendula (under herbs).

Uses, etc.—Stimulant, etc. The U.S.P. and B.P.C.F. have a tincture, 1 in 5 of proof spirit.

MATRICARIA.—German Chamomile.—The flower-heads of Matricaria Chamomilla.

N.O.—Compositæ.

Habitat.—Germany.

Characters.—About three-quarters of an inch broad, composed of a flattish, imbricate involucre, a conical, hollow, naked receptacle, about fifteen white, ligulate, reflexed ray florets, and numerous yellow, tubular, perfect florets, without pappus; strongly aromatic, and bitter.

Chemistry.—Volatile oil (a quarter per cent., different from oil of chamomile and containing a terpene, an oxidised portion, and *cærulein*), bitter extractive, and a little tannic acid.

Uses, etc.—Similar to chamomile. *Dose.*—15-60 grains in infusion; official in the U.S.P.

Note.—The similar flower-heads of ANTHEMIS ARVENSIS and MARUTA COTULA (*may-weed*), have a conical, solid, and chaffy receptacle.

PYRETHRI FLORES.—Insect Flowers.—The dried flower-heads of Pyrethrum cinerariæfolium (obtained from Dalmatia), P. roseum, P. carneum (obtained from the Caucasus), etc.

N.O.—Compositæ.

Habitat.—Caucasus, Austria, etc.

Characters.—The capitula usually consist of a pale greyish-green epicalyx, enclosing numerous florets, the outer two or three whorls of which are nearly white and ligulate, the inner yellow and tubular. The florets are inserted upon a slightly convex (not conical) solid receptacle; odour peculiar, somewhat narcotic.

Chemistry.—Volatile oil, resins (active), etc.

Uses, etc.—As insecticide in the form of powder; the Dalmatian variety is preferred.

CARTHAMUS.—Safflower.—The florets of Carthamus tinctorius.

N.O.—Compositæ.

Habitat.—Indigenous to India; cultivated.

Characters.—About four-fifths of an inch long, tubular, with divided limb; the tube of the anther is about one-fifth of an inch long; it protrudes from the throat, and is surmounted by the long filiform yellow style. Colour at first yellow, but becomes red, and when dry is brownish red. Odour disagreeable, taste bitterish.

Chemistry.—*Carthamin* or *carthamic acid*, on which the value of safflower as a dye depends.

Uses, etc.—As colouring agent.

CROCUS.—Saffron.—The dried stigmas and tops of the styles of Crocus sativus.

N.O.—Irideæ.

Syn.—Hay Saffron.

Habitat.—Spain, France, and Italy.

Characters.—Each entire portion of commercial saffron is an inch or somewhat more in length; it consists of three thread-like orange-red stigmas, thickened and tubular above, and jagged or notched at their extremities, and united below to the top of the yellow style. It is flexible, unctuous to the touch, with a peculiar strong aromatic odour, and a bitter somewhat aromatic taste. Rubbed on the wet finger it leaves an intense orange-yellow tint. When pressed between folds of white filtering paper it leaves no oily stain. When a small portion is placed in a glass of warm water it colours the liquid orange-yellow, but should not deposit any white or coloured powder. Ignited with free access of air, it yields about six per cent. of ash.

Saffron contains about twelve per cent. of moisture and the amount of ash calculated on the dried drug should not exceed seven per cent.

Chemistry.—Volatile oil (not acrid, heavier than water), fixed oil, wax, mucilage, sugar, and *crocin* (*polychroite*) $C_{44}H_{70}O_{28}$. Crocin, the colouring principle, is a glucoside, easily soluble in water and dilute alcohol; by lime and baryta it is resolved into *crocetin* (*crocin*) and a sugar (*crocose*). A bitter principle, *saffron-bitter* or *picro-crocin* is also said to be present.

Uses, etc.—Has a slightly stimulant action; chiefly used for the purposes of a colouring agent.

B.P. Preparation.

Tinctura Croci - - - - 1 in 20 of proof spirit.

Contained also in Decoctum Aloes Compositum, Pilula Aloes et Myrrhæ, Pulvis Cretæ Aromaticus, Tinctura Cinchonæ Composita, Tinctura Opii Ammoniata, Tinctura Rhei.

Note.—ADULTERATIONS.—The following list includes the more commonly found adulterants:—The anthers of Crocus sativus; the florets of *safflower* (see below), *arnica* and *marigold*; exhausted stigmata of Saffron, which, of course, would possess little, if any, colouring power; shreds of smoked beef, which would be detected when heated with soda lime, when a strong odour of ammonia would be evolved; inorganic matter such as sulphates of barium and calcium, chalk, these being fixed by means of gum glycerine, or glucose. The moisture is not infrequently abnormal; it should not be more than about twelve per cent. *Cake saffron* (*Crocus in placenta*) consists of safflower florets made into cakes with treacle, mucilage, or some similar sticky liquid.

ZEA.—Zea.—The styles and stigmas of Zea Mays.

N.O.—Gramineæ.

Syn.—Stigmata Maydis, Corn-silk.

Habitat.—Tropical America; cultivated.

Characters.—Thread-like; about six inches long and one-fiftieth of an inch broad, yellowish or greenish, soft-silky, finely-hairy, inodorous, taste sweetish.

Chemistry.—Sugar, mucilage, albumen, etc., and *maizenic acid.*

Uses, etc.—Diuretic and mild stimulant. Official in the U.S.P. for the production of a fluid extract.

AURANTII FLORES.—Orange Flowers.—The flowers of Citrus vulgaris and Citrus Aurantium.

N.O.—Rutaceæ.

Habitat.—India; cultivated widely.

Characters.—These flowers contain a fragrant volatile oil, and are used for producing orange flower water, the bulk of which is imported from France.

B.P. Preparations.—Aqua Aurantii Florum, from which is prepared Syrupus Aurantii florum.

Note.—The essential oil, *Oleum Aurantii Florum*, U.S.P. *(Oleum Neroli)* has S.G. ·860 to ·890, and is soluble in all proportions of rectified spirit and alcohol. *Oil of petit grain* is obtained by distillation of the leaves and small unripe fruits of the bitter and sweet orange.

LAVANDULA.—Lavender.—The flowers of Lavandula vera.

N.O.—Labiatæ.

Habitat.—Cultivated at Hitchin and Mitcham.

Characters.—Calyx tubular, blue-grey, hairy, five-toothed, the upper tooth largest and roundish-rhomboid; corolla violet-blue, hairy and glandular on the outside, tubular and two-lipped, the upper lip two-lobed, the lower lip three-lobed; stamens four, short, on the corolla tube; odour fragrant; taste bitterish, aromatic, somewhat camphoraceous.

Chemistry.—Volatile oil (1·5 per cent.); *see* Oleum Lavandulæ.

Uses, etc.—For producing the oil.

Note.—LAVANDULA SPICA (*spike lavender*).—The flowers of this plant have linear bracts, while those of the above are rhomboidal; by distillation they yield *oil of spike lavender*.

LAVANDULA STŒCHAS.—Has a flower-spike mounted on a short stalk and terminating in two or three conspicuous purple bracts. The flower heads were formerly found in commerce under the name of *Flores Stœchados*.

7. HERBS.—HERBÆ.

THE drugs which are included under this head may, as in the case of Chiretta, consist of the whole plant, but more frequently the term herbs is applicable to the young upper part of the plant, consisting of the more or less succulent shoots with the attached leaves and flowers. A complete description of a flowering herb will thus include mention of the nature of the stem, with its method of branching; the character of the leaves and the method of their arrangement upon the stem; the nature of the inflorescence and of the flowers which go to make it up.

SCOPARII CACUMINA.—Broom Tops.—

The fresh and dried tops of Cytisus scoparius (Sarothamnus scoparius).

N.O.—Leguminosæ.

Syn.—Genista Scoparia, Spartium scoparium.

Habitat.—Britain.

Characters.—Branched, straight, with five wing-like angles, dark-green or yellowish.green, nearly smooth, tough. Leaves, when present, small, sessile and simple above, stalked and trifoliate below. Taste bitter and nauseous; odour when fresh and bruised peculiar, but this is nearly lost by drying.

Chemistry.—*Scoparin*, $C_{21}H_{22}O_{10}$ (a diuretic principle), and the volatile alkaloid, *sparteine*, $C_{15}H_{26}N_2$. Volatile oil, tannin, fat, sugar, etc., are also present. Sparteine is a colourless liquid heavier than water, in which it is only slightly soluble. It neutralizes acids, and behaves in all ways as an alkaloid.

Uses, etc.—Diuretic and cathartic.

B.P. Preparations.

Decoctum Scoparii - - -	from dried tops, 1 in 20.
Succus Scoparii - - - -	from fresh herb.

Preparations other than B.P.—Sparteine (the alkaloid) forms certain salts of which the sulphate (official in the U.S.P.) is most used in medicine. *Sparteine sulphate* ($C_{15}H_{26}N_2.H_2SO_4,5H_2O$) occurs in colourless crystals, readily soluble in water. *Dose.*—1-4 grains; hypodermic lamellæ are prepared from it.

TUSSILAGO.—Coltsfoot.—The dried herb of Tussilago farfara.

N.O.—Compositæ.

Habitat.—Britain.

Characters.—A perennial herb with creeping root, which early in spring sends up several leaflets, erect, simple, unifloral scapes or flower-stems, five to six inches high, bearing adpressed scale-like bracts of a brownish-pink colour. The flower, which stands singly at the end of the scape is large, yellow, compound, with hermaphrodite florets in the disk, and female florets in the ray. The latter are numerous, linear, and twice the length of the former. The leaves appear after the flowers have blown. They are radical, petiolate, large, cordate, angular, toothed at the margin, bright green upon the upper surface, white and downy beneath.

Chemistry.—Mucilage, bitter amorphous glucoside, tannin, etc.

Uses, etc.—Demulcent, tonic. *Dose.*—30-60 grains. Usually given in decoction.

GRINDELIA.—Grindelia.—The leaves and flowering tops of Grindelia robusta.

N.O.—Compositæ.

Habitat.—North America.

Characters.—Leaves about two inches or less long, varying from broadly spathulate or oblong to lanceolate, sessile or clasping, obtuse, more or less sharply serrate, pale-green, smooth, finely dotted, brittle; heads many flowered; the involucre hemispherical, about half an inch broad, composed of numerous imbricated, squarrosely-tipped scales; ray-florets yellow, ligulate, pistillate; disk-florets yellow, tubular, perfect; pappus consisting of about three awns of the length of the disk-florets; odour balsamic; taste pungently aromatic and bitter.

Chemistry.—Resin, a glucoside allied to saponin, and a small quantity of alkaloid.

Uses, etc.—Sedative in asthma, etc. *Dose.*—15-30 grains. Official in the U.S.P. for the production of a fluid extract; a similar preparation is included in the B.P.C.F.

Note.—Squarrose Grindelia—likewise official in the United States—is obtained from Grindelia Squarrosa, a Californian species, which differs but little or not at all in botanical characters from G. robusta. It is said that it is the *squarrose* variety which is imported into England.

LOBELIA.—Lobelia.—The dried flowering herb of Lobelia inflata.

N.O.—Campanulacæ.

Syn.—Indian Tobacco.

Habitat.—North America.

Characters.—Usually in compressed oblong rectangular packages, weighing from half a pound to a pound each, and wrapped in sealed and labelled papers. The separate pieces are of varying lengths, yellowish-green, angular, and bearing sessile or stalked, hairy, oval, irregularly-toothed leaves, together with some flowers and fruits. Odour somewhat irritating; taste at first mild, but, after chewing, burning and acrid.

Chemistry.—An alkaloid *lobeline* in combination with *lobelic acid*, volatile oil, fixed oil, and a fat-like substance called *inflatin.* Lobeline is a non-volatile alkaloid, obtainable in the form of a white powder and forming crystallizable salts with mineral acids. The so-called *lobelacrine*, formerly considered to be the acrid principle, is probably lobelate of lobeline.

Uses, etc.—Anti-spasmodic, expectorant, diaphoretic, etc.

B.P. Preparations.

Tinctura Lobeliæ - - - -	1 in 8 of proof spirit.
Tinctura Lobeliæ Ætherea -	1 in 8 of spirit of ether.

Note.—The U.S.P. includes a fluid extract, and a vinegar of Lobelia was formerly official therein.

CHIRATA.—Chiretta.—The dried plant, Ophelia Chirata. Collected when the fruit begins to form.

N.O.—Gentianaceæ.

Syn.—Indian Gentian.

Habitat.—Northern India.

Characters.—Root two to three inches long, usually unbranched. Stem three feet or more long, rounded below and slightly quadrangular above, branched in a dichotomous manner, smooth, orange-brown or purplish. Leaves ovate, five to seven ribbed; flowers small, numerous, panicled. No odour; taste very bitter. The stem, except in the lower part, consists of a thin woody ring, enclosing a large continuous easily separable pith of a yellowish colour.

Chemistry.—*Ophelic acid* ($C_{13}H_{20}O_{10}$) and *chiratin* ($C_{26}H_{48}O_{15}$). Ophelic acid is a bitter, viscid liquid soluble in water; chiratin is a crystalline glucoside breaking up under the action of dilute acids into ophelic acid and *chiratogenin.*

Uses, etc.—As a pure, bitter tonic.

B.P. Preparations.

Infusum Chiratæ - - - -	1 in 40.
Tinctura Chiratæ - - - -	1 in 8 of proof spirit.

Note—This species of Chirata is variously known as Swertia, Agathotes, Gentiana and Ophelia Chirata. *Paharee Chiretta* [Ophelia (Swertia) angustifolia] is sometimes imported as true Chiretta; this adulterant may be distinguished by the absence of any distinct pith, and by the thickness of the wood, as seen when cut transversely. The lower portion of the stem is also quadrangular. Its infusion is of a paler colour. The root of *Munjeet* (Rubia Cordifolia) has been occasionally found in the centre of the bundles of Chiretta. Other adulterants or substitutions noted are O. Alata and Andrographio paniculata.

DULCAMARA.—Bittersweet.—The dried young branches of Solanum Dulcamara. Collected from plants which have shed their leaves.

N.O.—Solanaceæ.

Syn.—Woody nightshade.

Habitat.—Britain.

Characters.—About a quarter of an inch or less thick, cylindrical, somewhat angular, longitudinally striate, more or less warty, usually hollow in the centre, cut into short sections. The thin bark is externally pale-greenish or light greenish-brown, marked with alternate leaf scars, and internally green; the greenish or yellowish wood forms one or two concentric rings. Odour slight; taste bitter, afterwards sweet. The leaves of bittersweet are alternate, petiolate, and frequently auriculate. The inflorescence is cymose, the petals being deeply five-lobed and purple. The baccate fruits are oval, at first green, but acquiring as they ripen a bright red colour.

Chemistry.—*Solanine*, an alkaloid crystalline or amorphous, insoluble or nearly so in water; *dulcamarin*, a glucoside decomposable into *dulcamaretin* and glucose. A bittersweet body *picroglycion* is also said to be present.

Uses, etc.—Mild narcotic, etc. *Dose.*—60-120 grains. Official in the U.S.P. for the production of a fluid extract. Formerly included in the B.P.

Note.—ALLIED SPECIES:—

SOLANUM NIGRUM *(common garden* or *black nightshade)* has ovate-stalked leaves, with coarse angular teeth; flowers white and baccate fruits black. This plant also contains solanine.

S. TUBEROSUM (*common potato*). The green parts of this plant are said to contain solanine.

S. LYCOPERSICUM (*tomato*).—Solanine has been obtained from the herbaceous parts, and is present also probably in the seeds.

S. PANICULATUM (*jerubeba*) is largely used in S. America in liver complaints, etc.

The *Jerusalem cherry* and *susumber berries* are obtained from species of Solanum and probably contain the alkaloid solanine.

MARRUBIUM.—Horehound.—The leaves and tops of Marrubium vulgare.

N.O.—Labiatæ.

Habitat.—Europe.

Characters.—Leaves about one inch long, opposite, petiolate, roundish-ovate, obtuse, coarsely crenate, strongly rugose, downy above, white, hairy beneath; branches quadrangular, white, tomentose; flowers in dense, axillary, woolly whorls, with a stiffly ten-toothed calyx, a whitish, bi-labiate corolla, and four included stamens; aromatic and bitter.

Chemistry.—Volatile oil, *marrubin* (a bitter principle), with resin, tannic acid, and other common principles.

Uses, etc.—Stimulant, tonic, etc. *Dose.*—15-30 grains in infusion. Official in the U.S.P.

CANNABIS INDICA.—Indian Hemp.—The dried flowering or fruiting tops of the female plants of Cannabis sativa; grown in India, and from which the resin has not been removed. It is known in India as Gunjah or Ganga.

N.O.—Urticaceæ.

Habitat.—India.

Characters.—In small more or less aggregated masses, from about one and a half to two and a half inches in length, and consisting of the tops of one or more alternate branches bearing the remains of the flowers and smaller leaves with a few ripe fruits, and the whole pressed together by adhesive resinous matter; or, it is composed of straight, stiff woody stems several inches long, surrounded by the branched flower stalks. It is rough to the touch, very brittle, of a dusky-green colour, with scarcely any taste, but having a faint, peculiar, narcotic, not unpleasant odour.

Chemistry.—Several resins, one of which is known as *cannabine* and volatile oil, consisting of two distinct parts, are present. Two alkaloids, *cannabinine* and *tetano-cannabine* have also been described as present; the chemistry of Indian hemp requires further investigation.

Note.—The seeds contain 25 per cent. of fixed oil, a fact which should be taken into consideration in preparing the extract.

Uses, etc.—Sedative and hypnotic.

B.P. Preparations.

Extractum Cannabis Indicæ -	alcoholic; yield, 10-15 per cent.
Tinctura Cannabis Indicæ - -	1 of extract in 20 of rectified spirit.

Preparations other than B.P.—The U.S.P. includes a fluid extract; a compound of tannin with cannabine (*cannabine tannate*) is made, but its value is doubtful; the softer resinous portion of the drug is met with under the name of *cannabinon.*

Note.—This diœcious plant is identical with the ordinary English hemp, Cannabis sativa, in botanical structure, the difference being that the latter does not secrete the peculiar resin which the Indian variety does. The ripe fruit of each is similar in physical characters. Of the native preparations of Indian hemp may be mentioned:—

(1). *Churrus.*—This consists of the resinous exudation from the leaves, slender stems, and branches. It is collected from the growing plants by natives clad in leathern dresses or naked, who run through the hemp fields; the soft resin adheres to the leather or skin and is subsequently removed. This is the most intoxicating preparation derived from this plant. It comes from the Himalayas, Herat, and Yarkund.

(2). *Ganjah, gunjah, guaza.*—Consists of the dried plant which has flowered and from which the resin has not been removed. It is sold for smoking chiefly, and yields to alcohol 20 per cent. of resinous extract, composed of churrus and chlorophyll.

(3). *Bhang, bang, subjee,* or *sidhee* (Hindustanee); *hashish* (Arabic) is formed of the larger leaves and capsules, without the stalks. It may occur under the name of hashish in dark-coloured, soft, lozenge-shaped pieces, which seems to be composed of resin, sugar, and flavouring spices. It is used for smoking.

EUPHORBIA.—**Euphorbia.**—The dried herb Euphorbia pilulifera.

N.O.—Euphorbiaceæ.

Habitat.—Queensland and South America, etc.

Characters.—Leaves opposite, shortly stalked, ovate to ovate-lanceolate or oblong, three quarters to one and one-half inches long, denticulate, oblique and narrow below, or with a semi-cordate base. Flower-heads minute, numerous, crowded in bead-like cymes, globular, borne on a short stalk in one axil only of each pair of opposite leaves.

Chemistry.—Glucosides, resin and wax, with traces of tannin.

Uses, etc.—In asthma, etc. The B.P.C.F. includes a tincture (1 in 5 of proof spirit) and an extract is also prepared.

SABINÆ CACUMINA.—Savin Tops.—The fresh and dried tops of Juniperus Sabina. Collected in spring from plants cultivated in Britain.

N.O.—Coniferæ.

Habitat.—Britain.

Characters.—Twigs densely covered with minute imbricated adpressed dark green (or when dried, yellowish-green) leaves, with a large, oval, depressed, central gland on their back. Odour, when rubbed or bruised, strong and peculiar; taste acrid, bitter and disagreeable.

Chemistry.—Volatile oil 1-3 per cent., resin, tannin, etc.

Uses, etc.—Local and general irritant. *Dose.*—4-10 grains in powder.

B.P. Preparations.

Oleum Sabinæ - - -	distilled from fresh tops.
Tinctura Sabinæ - - -	1 in 8 of proof spirit.
Unguentum Sabinæ - -	1 in 2, nearly.

OLEUM SABINÆ B.P., the volatile oil, is colourless or pale-yellow, of S.G. ·910 to ·940, and is soluble in an equal volume of alcohol.

Note.—The tops of JUNIPERUS VIRGINIANA (red cedar) are sometimes substituted for savine, and are not readily distinguishable; the peduncle of the fruit (galbulus) is, however, erect, whilst that of J. sabina is drooping; the odour and taste of the two drugs is also different.

PULSATILLA.—Pulsatilla.—The herb of Anemone pulsatilla, of Anemone pratensis, and of Anemone patens, collected soon after flowering. It should be carefully preserved, and not be kept longer than one year.

N.O.—Ranunculaceæ.

Habitat.—Indigenous to Central and Northern Europe.

Characters.—Leaves radcal, petiolate, silky villous, twice or thrice deeply three-parted or pinnately cleft, with linear, acute lobes, appearing after the large purple (or in the last-named species sometimes whitish) flowers; inodorous, very acrid.

Chemistry.—A very acrid yellow oil, obtained by distillation with water, and which becomes rapidly changed into *anemonin* (colourless, crystalline), and *anemonic acid.*

Uses.—Much used by homœpathic practitioners; said to be diuretic and expectorant; included in the U.S.P.

CHELIDONIUM.—Celandine.—The herb of Chelidonium majus.

N.O.—Papaveraceæ.

Habitat.—England.

Characters.—Stem about two feet high, branching; leaves alternate, petiolate, oblong or oval, lyrately-pinnatifid or pinnate. Flowers on long peduncles, with two sepals, and four yellow petals. Fruit, a long, linear, one-celled capsule. Seeds, many crested. The whole plant contains a saffron-coloured latex.

Chemistry.—Five alkaloids are said to be present, viz.:—*chelidonine, chelerythrine, α-homochelidonine, β-homochelidonine*, and *protopine.* In addition to these, two acids, viz., *chelidonic* and *chelidoninic*, are described, and also a body named *chelidoxanthin*, which has basic properties.

Uses, etc.—Diuretic, cathartic. *Dose.*—15-60 grains; official in the U.S.P. The juice of the plant is a popular external application for warts.

HELIANTHEMUM.—Helianthemum.—The herb of Helianthemum Canadense and of Helianthemum corymbosum.

N.O.—Cistineæ.

Syn.—Frost-wort, rock-rose.

Habitat.—N. America.

Characters.—About twelve inches high; stem rigid, slender, hairy; leaves alternate, elliptic or linear-lanceolate, about four-fifths of an inch long, woolly beneath; flowers single, wtth five large petals, or in clusters, nearly sessile and apetalous; inodorous, bitter, astringent.

Chemistry.—Tannin, a glucoside, sugar, gum, wax, etc.

Uses, etc.—Tonic. astringent. *Dose.*—8-30 grains in decoction.

HYPERICUM.—Hypericum.—The herb of Hypericum perforatum.

N.O.—Hypericineæ.

Syn.—St. John's Wort.

Habitat.—Europe and Asiâ.

Characters.—Erect, about twenty inches high, smooth; stem somewhat two-edged, leaves opposite, sessile, linear-oblong, pellucid-punctate; flowers about four-fifths of an inch broad, in terminal cymes, yellow, black dotted; odour slight, balsamic; taste acrid, bitter.

Chemistry.—Resin, tannin and red colouring matter.

Uses, etc.—An old-fashioned domestic remedy, now more or less obsolete. *Oleum hyperici (red oil)* is prepared by macerating the herb in olive oil.

MELILOTUS.—Melilot.—The herb of Melilotus officinalis (M. officinalis) and M. albus.

N.O.—Leguminosæ.

Syn.—Sweet clover.

Habitat.—Europe.

Characters.—Erect, about four feet high, smooth, much branched; leaves alternate, trifoliate; leaflets oval or obovate-oblong, sharply serrate, near the base, entire; flowers small, yellow or white, racemose; legume small, wrinkled; odour fragrant; taste aromatic, somewhat pungent and bitter.

Chemistry.—Coumarin, *melilotol* (a fragrant volatile oil), coumaric acid ($C_9H_8O_3$), *melilotic acid* ($C_9H_{10}O_3$).

Uses, etc.—An old-fashioned drug, now practically obsolete.

EPILOBIUM.—Epilobium.—The herb of Epilobium angustifolium.

N.O.—Onagrarieæ.

Syn.—Willow herb.

Habitat.—Northern hemisphere, generally.

Characters.—Erect, smooth, about forty inches high; leaves sub-sessile, alternate, lanceolate, pointed, nearly entire, pale-green beneath; inflorescence racemose; taste mucilaginous, astringent.

Chemistry.—Mucilage, tannin, etc.

Uses, etc.—Demulcent, astringent. *Dose.*—30-60 grains.

VIOLÆ HERBA.—Pansy.—The wild-grown flowering herb of Viola tricolor.

N.O.—Violaceæ.

Habitat.—Europe.

Characters.—Stem angular and nearly smooth, leaves alternate, ovate, crenate, petiolate, and with large foliaceous stipules; flowers spurred, inodorous; taste bitter and acrid.

Chemistry.—Mucilage, sugar, salicylic acid, bitter principle, resin, etc.

Uses, etc.—Alterative, expectorant. *Dose.*—15-60 grains; formerly official in the U.S.P.

EUPATORIUM.—Thoroughwort.—The leaves and flowering tops of Eupatorium perfoliatum.

N.O.—Compositæ.

Syn.—Boneset.

Habitat.—Canada and United States of America.

Characters.—Leaves opposite, united at base, lanceolate, from four to six inches long, tapering, crenately-serrate, rugosely veined, rough above, downy and resinous-dotted beneath; flower-heads corymbed, numerous, with an oblong involucre of lance-linear scales, and with from ten to fifteen white florets, having a bristly pappus in a single row; odour weak and aromatic; taste astringent and bitter.

Chemistry.—Volatile oil, some tannic acid, and a bitter principle.

Uses, etc.—Stimulant, laxative, etc. *Dose.*—30-60 grains: official in the U.S.P. for the production of a fluid extract.

VINCA.—Periwinkle.—The herb of Vinca major and of V. minor.

N.O.—Apocynaceæ.

Syn.—Pervenche.

Characters.—Stem ascending or prostrate, leaves ovate-acute or subcordate. Flowers large, purplish-blue.

Chemistry.—Tannin, etc.

Uses, etc.—As a mild astringent; given in infusion and fluid extract.

ERIGERON.—Flea-bane.—The flowering herb of Erigeron Canadense.

N.O.—Compositæ.

Habitat.—Canada and United States of America.

Characters.—Stem bristly, hairy, erect, and much branched; leaves linear-lanceolate, hairy, and mostly entire; capitula small, numerous, with a cylindrical involucre, many capillary ray-florets which are nearly included in the involucre, and a straw-coloured, bristly pappus; aromatic odour, and bitterish, somewhat acrid and astringent taste.

Chemistry.—The chief constituent is the volatile oil, the composition of which is not well known. It is a pale-yellow liquid, becoming darker and thicker by age and exposure to air; having a peculiar, aromatic, persistent odour; an aromatic, slightly pungent taste, and a neutral reaction. S.G., about 0·864. It is readily soluble in alcohol.

Uses, etc.—Stimulant, diuretic, etc. *Dose.*—30-60 grains in infusion. The oil is included in the U.S.P.

Note.—ALLIED SPECIES.—E. PHILADELPHICUM, E. ANNUUM, E. STRIGOSUM, have similar constitution and properties.

COTULA.—Mayweed.—The herb of Anthemis cotula.

N.O.—Compositæ.

Syn.—Wild chamomile.

Habitat,—Europe.

Characters.—Nearly smooth, pale-green: stem ascending, branched. furrowed, leaves sessile, thrice pinnatifid with linear, subulate segments; flower heads terminal with a conical chaffy receptacle, white ligulate neutral rays, yellow perfect disk-florets and obvoid akenes devoid of pappi; odour unpleasantly aromatic; taste bitter, acrid.

Chemistry.—Volatile oil, valeric acid, anthemidine (alkaloid), and anthemidic acid.

Uses, etc.—Stimulant, antispasmodic, sudorific. *Dose.*—30-120 grains in infusion.

ACHILLEA.—Yarrow.—The herb of Achillea millefolium.

N.O.—Compositæ.

Syn.—Millefoil.

Habitat.—Indigenous.

Characters.—Erect, hairy; leaves nearly sessile, lanceolate, glandular beneath; from two to ten inches long, tripinnate with linear-spathulate, toothed segments; flower-heads corymbose with an oblong imbricate involucre, flat chaffy receptacle and five rays; odour somewhat chamomile-like; taste bitter, aromatic.

Chemistry.—Volatile oil, resin, *achilleine* (bitter, soluble in water) tannin and *achilleic* (aconitic) *acid.*

Uses, etc.—Stimulant, emmenagogue. *Dose.*—30-60 grains in infusion.

TANACETUM.—Tansy.—The leaves and tops of Tanacetum vulgare.

N.O.—Compositæ.

Habitat.—Europe.

Characters.—Leaves about six inches long; bipinnatifid, the segments oblong, obtuse, serrate or incised, smooth, dark green, and glandular; flower-heads corymbose, with an imbricated involucre, a convex, naked receptacle, and numerous yellow, tubular florets.

Chemistry.—*Tanacetin*, tannic acid, volatile oil (leaves, ·066 per cent.; flowers, 1·49 per cent.), waxy, resinous, and albuminous bodies, with sugar, and vegetable acids.

Uses, etc.—Stimulant, tonic, diuretic, etc. *Dose.*—15-60 grains in infusion; included in the U.S.P.

ABSINTHIUM.—Wormwood.—The leaves and tops of Artemisia Absinthium.

N.O.—Compositæ.

Habitat.—Northern Africa and Europe.

Characters.—Leaves about two inches long, hoary, silky-pubescent, petiolate, roundish-triangular in outline, pinnately two or three-cleft, with the segments lanceolate, the terminal one spathulate, bracts three-cleft or entire; heads numerous, subglobose, with numerous small, pale yellow florets, all tubuluar and without pappus; odour aromatic; taste persistently bitter.

Chemistry.—Volatile oil (1·5 per cent., consisting chiefly of *absinthol* $C_{10}H_{16}O$); *absinthin* (a crystallizable bitter principle); bitter resin (2·5 per cent.); and green resin (5 per cent.)

Uses, etc.—Tonic, febrifuge. *Dose.*—15-60 grains in tincture, etc. Official in the U.S.P. and in several of the Continental Pharmacopœias. The volatile oil is the active ingredient of the French liqueur, *absinthe.*

CALENDULA.—Marigold.—The fresh flowering herb of Calendula officinalis.

N.O.—Compositæ.

Habitat.—S. Europe.

Characters.—Stem somewhat angular, rough; leaves alternate, thickish, hairy, spathulate or oblanceolate, slightly toothed, the upper ones sessile; flower heads nearly two inches broad, the yellow strap-shaped, ray-florets in one or several rows, fertile, the achenes incurved and muricate; odour slightly narcotic; taste bitter and saline.

Chemistry.—*Calendulin* (a carbohydrate) and an amorphous bitter principle, etc.

Uses, etc.—Stimulant, vulnerary, etc. *Dose.*—8-30 grains; formerly official in the U.S.P.

CARDUUS BENEDICTUS.—Blessed Thistle.—The herb of Cnicus benedictus.

N.O.—Compositæ.

Habitat.—South Europe.

Characters.—Erect, somewhat woolly; leaves sessile above, and somewhat decurrent, alternate, lance-oblong, sinuately-lobed, soft spiny; flower-heads ovate, about an inch long, with an imbricate spinously-pointed involucre and a flat receptacle; odour slight, disagreeable; taste bitter.

Chemistry.—Volatile oil, tannin, and *cnicin* $C_{42}H_{56}O_{15}$. Cnicin is a bitter, crystalline, neutral body, soluble in alcohol and slightly also in water; it is said to be analogous to salicin in its properties.

Uses, etc.—As diaphoretic and tonic. *Dose.*—15-60 grains.

MENTHA PIPERITA.—Peppermint.—The leaves and tops of Mentha piperita.

N.O.—Labiatæ.

Habitat.—Europe.

Characters.—Leaves about two inches long, petiolate, ovate-lanceolate, acute, sharply serrate, glandular, nearly smooth; branches quadrangular, often purplish; flowers in terminal, conical spikes, with a tubular, five-toothed, often purplish calyx, a purplish, four-lobed corolla, and four short stamens; odour aromatic; taste pungent and cooling.

Chemistry.—Volatile oil (0·25 to 1 per cent.), tannin, resin, gum, etc. (see *Oleum Menthæ Piperitæ*).

Uses, etc.—As source of the oil; official in the U.S.P., where it enters into the composition of a spirit of peppermint.

MENTHA VIRIDIS.—Spearmint.—The leaves and tops of Mentha viridis.

N.O.—Labiatæ.

Syn.—Mentha sativa.

Habitat.—Europe.

Characters.—Leaves about two inches long, sub-sessile, lance-ovate, acute, serrate, glandular, nearly smooth; branches quadrangular, mostly light-green; flowers in terminal, interrupted, narrow, acute spikes, with a tubular, sharply five-toothed calyx, a light purplish, four-lobed corolla, and four rather large stamens; aromatic and pungent.

Chemistry.—The chief constituent is the volatile oil (1 per cent.); see *Oleum Menthæ Viridis.*

Uses, etc.—As source of the oil; official in the U.S.P., where it enters into the composition of a spirit of spearmint.

HYSSOPUS.—Hyssop.—The herb of Hyssopus officinalis.

N.O.—Labiatæ.

Habitat.—S. Europe.

Characters.—Stem branched, wand-like; leaves sessile, one inch long, linear-lanceolate, obtuse; flowers in small clusters with five-toothed calyx, two-lipped purple corolla, and four exserted stamens; aromatic, pungent, bitterish.

Chemistry.—Volatile oil, which is a mixture of several oxygenated oils.

Uses, etc.—Carminative, stimulant. *Dose.*—15-60 grains in infusion.

ORIGANUM.—Wild Marjoram.—The herb of Origanum vulgare.

N.O.—Labiatæ.

Habitat.—Asia, Europe, and North Africa.

Characters.—Stem branched above, often purplish, leaves opposite, petiolate, about one inch long, roundish-ovate, obtuse, nearly entire, pellucid, punctate, hairy beneath; flowers in corymbs, with reddish bracts, a five-toothed calyx, a somewhat two-lipped pale purple corolla, and four exserted stamens; aromatic, pungent, and bitterish.

Chemistry.—Yields volatile oil (about 2 per cent.) of S.G. 0·87 to 0·91; it is soluble in twelve parts of rectified spirit and fulminates with iodine.

Red oil of Thyme is imported and sold as oil of origanum, and is often adulterated with oils of turpentine, spike lavender and rosemary, coloured with alkanet root.

Uses, etc.—Carminative, stimulant, etc. *Dose.*—15-60 grs. in infusion.

Note.—Sweet Marjoram (ORIGANUM MAJORANA) has a two-lipped calyx and a whitish corolla; it also contains a volatile oil and has properties similar to the above.

MELISSA.—Balm.—The leaves and tops of Melissa officinalis.

N.O.—Labiatæ

Habitat.—Europe.

Characters.—Leaves about two inches long, petiolate, ovate, obtuse, crenate, somewhat hairy, glandular; branches quadrangular; flowers in about four-flowered cymules, with a tubular, bell-shaped, five-toothed calyx, a whitish or purplish two-tipped corolla, and four stamens; fragrant, aromatic and bitterish.

Chemistry.—Volatile oil ($\frac{1}{8}$ to $\frac{1}{4}$ per cent.), containing a stearoptene, and having a specific gravity of about 0·89.

Uses, etc.—Carminative, stimulant, etc. Official in the U.S.P. *Dose.*—15-60 grains in infusion.

HEDEOMA.—American Pennyroyal.—The leaves and tops of Hedeoma pulegioides.

N.O.—Labiatæ.

Habitat.—Indigenous to North America.

Characters.—Leaves opposite, short-petiolate, about half an inch long, oblong-ovate, obscurely serrate, glandular beneath; branches roundish-quadrangular, flowers in small axillary cymules, with a tubular-ovoid, two lipped and five toothed calyx, and a pale blue, spotted, two lipped corolla, containing two sterile and two fertile, exserted stamens; odour strong, mint-like, taste warm and pungent.

Chemistry.—Volatile oil (1 per cent.); its S.G. is 0·940, and it is readily soluble in alcohol; it contains *hedeomol* ($C_{10}H_{18}O$) and *pulegone* ($C_{10}H_{16}O$), both ketones, and formic and isoheptoic ethers.

Uses, etc.—Carminative and stimulant. *Dose.*—15-60 grains in infusion. Both the herb and the oil are included in the U.S.P.

MONARDA.—Horse-Mint.—The herb of Monarda punctata.

N.O.—Labiatæ.

Habitat.—United States of America.

Characters.—The stems are one to two feet high, herbaceous, obtusely angled, downy, whitish, branching; the leaves are about two inches long, oblong-lanceolate, remotely serrate, acute, narrowed at the base into a petiole, smooth above and glandular-dotted beneath; the flowers are of a yellow colour, spotted with red, brown or purple, and are arranged in cymules (or verticillasters) and surrounded by about eight leafy, sessile and entire bracts, which are pale yellow and purple in colour. Odour strong and aromatic. Taste warm, pungent and bitterish.

Chemistry.—The chief constituent is the volatile oil (1 per cent. or more). This is of a yellowish, reddish, or brownish-red colour; lighter than water; readily soluble in alcohol; crystallising below 5°C.; and of a peculiar fragrant odour and pungent taste. It contains a terpene and oxygenated compounds, the most important of which is *thymol* (*monardin*).

Uses, etc.—Carminative, stimulant, etc. *Dose.*—15-60 grains in infusion. The oil which is included in the U.S.P. may be used as a source of thymol.

SCUTELLARIA.—Scullcap.—The herb of Scutellaria lateriflora.

N.O.—Labiatæ.

Habitat.—North America.

Characters.—About twenty inches long, smooth; stem quadrangular, branched; leaves opposite, petiolate, about two inches long, ovate-lanceolate or ovate-oblong, serrate; flowers in axillary, one-sided racemes, with a pale-blue corolla, and a two-lipped calyx, closed in fruit, the upper lip helmet-shaped; odour slight; taste bitterish.

Chemistry.—Volatile oil, bitter principle, etc. *Scutellarin* is prepared by mixing a concentrated tincture with solution of alum; it is not a pure principle.

Uses, etc.—Antispasmodic, etc. *Dose.*—30-120 grains. Included in the U.S.P. for the production of a fluid extract.

Note.—Several other species of Scutellaria are collected and used in medicine.

GALIUM.—Goose grass.—The herb of Galium Aparine.

N.O.—Rubiaceæ.

Syn.—Cleavers.

Habitat.—Northern hemisphere.

Characters.—Stem climbing, quadrangular, retrorsely prickly; leaves in whorls of six to eight, linear-lanceolate, with mucronate margin and rough midrib; fruit two-seeded, covered with hooked bristles; inodorous; taste saline, somewhat astringent and bitter.

Chemistry.—Gali-tannic acid, rubichloric acid, etc.

Uses, etc.—As diuretic and antiscorbutic. *Dose.*—30-60 grains in infusion. The fresh juice is also used.

Note.—ALLIED SPECIES.—GALIUM VERUM (*cheese rennet*) contains the same principles as the above, and is sometimes used for colouring cheese, etc. G. TINCTORUM is used for dyeing purposes by the Indians. G. TRIFLORUM contains coumarin.

CENTAURIUM.—Centaury.—The herb of Erythrœa Centaurium.

N.O.—Gentianaceæ.

Habitat.—Europe.

Characters.—Stem one foot high, branching, divided above into a dichotomous panicle, bearing opposite, sessile, ovate-lanceolate, smooth and obtusely-pointed leaves; taste bitter; inodorous.

Chemistry.—Erythro-centaurin (colourless, crystalline, non-nitrogenous, reddened by sun-light), bitter principle, valeric acid, wax, etc.

Uses, etc.—Tonic, febrifuge. *Dose.*—30-60 grains in powder; formerly offiical in the Edinburgh Pharmacopœia; an ingredient of the *Portland powder.*

Note.—American Centaury is the herb of SABBATIA ANGULARIS; it is said to have constituents and properties similar to the above. *Quinine flower* is derived from SABBATIA ELLIOTTII.

THUJA. Arbor Vitæ.—The fresh tops of Thuja occidentalis.

N.O.—Coniferæ.

Syn.—White Cedar.

Habitat.—Canada; cultivated in Europe.

Characters.—Twigs flattish, two-edged, the scale-like leaves appressed and closely imbricate in four rows, rhombic-ovate, obtusely pointed, with a roundish gland upon the back; balsamic, somewhat terebinthinate odour, and a pungently aromatic, camphoraceous, and bitter taste.

Chemistry.—Volatile oil, *pinipicrin* (a bitter principle), *thujin* (a crystalline, colouring principle), wax, resin, and tannic acid are present,

Uses, etc.—Stimulant, diuretic, irritant. *Dose.*—15-60 grains in tincture or fluid extract. Also used externally in the form of an ointment.

Note.—CUPRESSUS THYOIDES is also and more correctly known as white cedar.

LINUM CATHARTICUM.—Purging Flax.—The herb of Linum catharticum.

N.O.—Lineæ.

Habitat.—Europe.

Characters.—Stem six inches to eight inches in height, dichotomous near the summit, with opposite, obovate-lanceolate, entire leaves and minute white flowers having obovate acute petals. Taste bitter, acrid.

Chemistry.—*Linin*, a neutral, colourless, principle, of a persistently bitter taste is the active constituent.

Uses, etc.—As gentle cathartic, etc. *Dose.*—60 grains in powder.

PULEGIUM.—Pennyroyal.—The herb of Mentha pulegium.

N.O.—Labiatæ.

Habitat.—Europe.

Characters.—Stem decumbent, branching, about six inches in height; leaves one-half to one inch in length, petiolate, ovate, blunt, crenate at the margin; dotted with oil glands; flowers in globose whorls; odour strong, pungent; taste highly aromatic.

Chemistry.—Volatile oil of which the S.G. is ·927.

Uses, etc.—Formerly much valued, and official in some countries; used as stimulant and emmenagogue. The oil (*oleum pulegii*) is still largely used, and a distilled water is also prepared.

LACTUCA.—Lettuce.—The flowering herb of Lactuca virosa.

N.O.—Compositæ.

Syn.—Acrid lettuce.

Habitat.—Europe.

Characters.—Stem from two to four feet in height, erect, prickly near the base, above smooth and divided into branches; lower leaves large, oblong-ovate, undivided, toothed, commonly prickly on the under-side of the midrib, sessile and horizontal; upper leaves smaller, clasping and often lobed; bracts cordate and pointed; flowers numerous, sulphur yellow, panicled; odour strong, opium-like; taste bitterish and acrid.

Chemistry.—In addition to the substances commonly found in herbs, strong-scented lettuce contains a minute quantity of hyoscyamine; the alkaloid is probably present only in the older plants. The full-grown herb contains much latex which constitutes the greater part of the commercial *lactucarium* (see *Lactucarium*.

Uses, etc.—As mild sedative, and chiefly as a source of lactucarium.

B.P. Preparation.

Extractum Lactucæ, from expressed juice; yield about 5 per cent.

Note.—The common garden lettuce (LACTUCA SATIVA) is also said to contain hyoscyamine, but in still less quantity than the above; it also yields a relatively smaller proportion of lactucarium.

8. FRUITS.—FRUCTUS.

THE fruit is the matured pistil including whatever may be joined to it, and enclosing the fertilized ovule or seed. The outer covering of the fruit which forms the seed vessel is known as the *pericarp*, and this is frequently represented by two layers—the *endocarp* and *exocarp*, with occasionally an intermediate *mesocarp*. The endocarp is not uncommonly hard and stony, forming a so-called *putamen*, while the exocarp may be either thin (*epicarp*) or fleshy (*sarcocarp*).

Fruits are—*simple*, *i.e.*, formed by the ripening of a single ovary; *aggregate*, from the ripening of a cluster of carpels of one flower crowded into a mass (raspberry); *accessory*, where the principal mass consists of the special development of some part of the flower not strictly belonging to the pistil (strawberry, dog rose); *multiple*, *i.e.*, formed by the union of a compact aggregation of the pistils of several flowers (*e.g.*, *sycon* of fig, *strobile* of hop, etc.) Simple fruits may be dry and *dehiscent*, *i.e.*, splitting into regular parts (*legume* of Leguminosæ, *cremocarp* of Umbelliferæ); dry and *indehiscent*, *i.e.*, not splitting when ripe (*achenes* of Compositæ, *grains* of Gramineæ, etc.); fleshy and dehiscent (*berry*, *drupe*, *pepo*, *hesperidium*, etc.)

The fruits which are made use of in medicine are frequently directed to be gathered unripe, since in their young state they contain a larger proportion of active constituents.

General Chemical Characters of Fruits.—The succulent fruits (prune, fig, raisin, bael, etc.) contain a notable quantity of sugar, mucilage, and vegetable acids, whilst many of the dry fruits owe their value in medicine to the presence of volatile oils and resins, this being especially true in the case of the Umbelliferæ. The fruits of the cereals (barley, wheat, etc.) are valuable only on account of the seeds which they contain, whilst in other cases (poppy, colocynth) the seeds are of little value in comparison with the parts which contain them.

ANISI STELLATI FRUCTUS.—Star Anise Fruit.—The dried fruit of Illicium Anisatum. From plants cultivated in China.

N.O.—Magnoliaceæ.

Syn.—Semen Badiani.

Habitat.—China.

Characters.—Star anise fruit is usually composed of eight fully-developed carpels, diverging horizontally in a stellate manner from a short central, generally stalked, axis. Each carpel is boatshaped, more or less beaked, irregularly wrinkled, of a rust-brown colour, and commonly split on its upper margin so as to expose its solitary, flattish, smooth, shining, somewhat oblique, reddish-brown seed. Odour and taste of both pericarp and seed closely resemble those of anise fruit.

Chemistry.—The fruit contains from two to three per cent. of volatile oil, three per cent. of fat, 10 per cent. of resin, with a small quantity of tannin, mucilage, etc. The seeds contain $1\frac{3}{4}$ per cent. of volatile oil, 20 per cent. of fixed oil, and some resin.

Uses, etc.—As source of oil of anise.

B.P. Preparation.—Oleum Anisi.

OLEUM ANISI—the volatile oil to the presence of which star anise fruit owes its value—is colourless or pale yellow, with the odour of the fruit and an aromatic, sweetish taste. It congeals at a temperature a few degrees above the freezing point of water, thus differing from the more or less chemically-identical oil obtained from the fruit of Pimpinella Anisum, which solidifies between 10° and 15·5° C. It dissolves in four parts of rectified spirit, and with a saturated solution of hydrogen chloride in absolute alcohol it gives a brownish-yellow or red colour, thus differing from the Pimpinella oil which, under the same treatment, gives a blue colour. Oil of anise consists mainly of *anethol* ($C_{10}H_{12}O$) with a small quantity of terpene ($C_{10}H_{16}$). By the oxidation of the anethol, *anisic aldehyde* is produced, and the melting point of the oil is lowered. The bulk of the oil of commerce is obtained from star anise.

B.P. Preparations.

Essentia Anisi - - -	1 in 5 of rectified spirit.
Tinctura Camphoræ Composita.	
Tinctura Opii Ammoniata.	

Note.—ADULTERATION OF STAR ANISE FRUIT.—ILLICIUM RELIGIOSUM (*N.O.*—Magnoliaceæ. *Habitat.*—Japan and China). The fruit of this species is one-third less in diameter than the official kind, and a few only of the carpels are generally developed to maturity. There is no taste of anise either in pericarp or seed. and the odour is not unlike that of oil of Laurus nobilis or distantly resembles oil of cubebs; it contains a non-solidifying volatile oil which has a S.G. 1·006, and a poisonous principle is also present. There are also several other species of Illicium which look like the official, but do not possess the same taste.

COCCULUS INDICUS.—The dried drupe of Anamirta cocculus (Anamirta paniculata).

N.O.—Menispermaceæ.

Syn.—Levant Nut.

Habitat.—India.

Characters.—The fruit usually met with in commerce is not a berry, but a drupe, of a reniform shape, about the size of a small hazel nut; epicarp brown and membranous, covering a hard woody shell. When the fruit is transversely cut the seed is seen to be semilunar, and generally occupies two-thirds of the interior, and is firmly attached to the placenta. No odour, but a very bitter taste resides in the seed.

Chemistry.—The seeds contain *picrotoxin* ($C_{30}H_{34}O_{13}$), *anamirtin* (*cocculin*) and a large percentage of fat. The pericarp contains *menispermine* (alkaline), *paramenispermine* (neutral) and *hypopicrotoxic acid.*

Uses, etc.—Externally as an insecticide; official in the Indian Pharmacopœia, which includes an ointment of the drug. The active principle, picrotoxin, is included in the B.P. (*see* Picrotoxinum).

PAPAVERIS CAPSULÆ.—Poppy Capsules.—The nearly ripe, dried capsules of the white poppy, Papaver somniferum.

N.O.—Papaveraceæ.

Syn.—Capita Papaveris.

Habitat.—Cultivated in Britain.

Characters.—Rounded, ovoid-rounded, or somewhat oblong, from two to three inches in diameter, suddenly contracted below into a neck, and crowned above by the stellately-arranged stigmas; yellowish or yellowish-brown externally, and frequently dotted with blackish spots, presenting internally a variable number of thin, brittle, parietal placentas, directed towards the centre of the cavity, and a very large number of loose, small, reniform, whitish, slate-coloured, or nearly black, seeds. Inodorous; taste slightly bitter.

There are two well-marked varieties of this species:—

(*a.*) Var. glabrum vel nigrum, which has a globose capsule, opening by pores under the stigma; seeds brownish-black; flowers violet or red of different tints, though sometimes white.

(*b.*) Var. album, which has an ovate globose capsule, indehiscent, the pores under the stigma either obliterated or absent; seeds and petals white.

Chemistry.—The composition of the capsules depends upon the state in which they are collected, morphine ·28 per cent., narcotine and rhœadine having been found in ripe capsules. Mucilage and a little waxy matter, and several organic acids, are present.

Uses, etc.—Similar to opium, but feeble, and on account of their variability in alkaloid, uncertain in action. Used as an external soothing application in poultice form. The seeds of the poppy capsules are rejected when required for official preparations, except in the case of Decoctum Papaveris.

B.P. Preparations.

Decoctum Papaveris - -	1 in 10.
Extractum Papaveris - -	aqueous and alcoholic; yield, about 20 per cent.
Syrupus Papaveris - - -	1 in 2¼, nearly.

Note.—Five samples of extract were found by Paul to contain from ·72 to 1·61 per cent. of morphine.

BELÆ FRUCTUS.—Bael Fruit.—The dried half-ripe fruit of Ægle Marmelos.

N.O.—Rutaceæ.

Syn.—Bengal Quince.

Habitat.—Malabar and Coromandel.

Characters.—Fruit (hesperidium) roundish, about the size of a large orange, with a hard woody, nearly smooth rind; usually imported in dried, more or less twisted slices, or in fragments consisting of portions of the rind and adherent dried pulp and seeds. Rind about one-eighth of an inch thick, hard, and covered with a nearly smooth pale-brown or greyish, firmly adherent epicarp ; the pulp firm and brittle, and of an orange-brown or cherry-red colour externally, but when broken it is seen to be nearly colourless internally. It has no odour, and the taste is simply mucilaginous and very slightly acid.

Chemistry.—Contains mucilage, pectic matter, vegetable acids, a volatile oil and a trace of tannin, the latter being insufficient, however, to produce a blackening with iron salts.

Uses, etc.—Used in dysentery, etc., and said to have astringent properties. The ripe fruit is eminently edible, and is used in preparing a confection.

B.P. Preparation.

Extractum Belæ Liquidum - - - 1 in 1.

Note.—SUBSTITUTIONS.—*Mangosteen fruit* (GARCINIA MANGOSTANA. *N.O.*—Guttiferæ. *Hab.*—Malacca) is about the size and shape of an orange, having a short woody stalk, and possessing at the opposite end to the stalk a disk consisting of radiating stigmas, which are dark-coloured and wedge-shaped. Its pericarp, which easily peels off, is of a dark reddish-brown or blackish colour. Internally it is mucilaginous when moistened, and the pulp is separable from the pericarp. It contains tannin, resin, and a crystallisable principle, *mangostine*. *Elephant-apple* or *wood apple* (FERONIA ELEPHANTUM. *N.O.*—Rutaceæ. *Hab.*—India) is also sometimes substituted. It differs from the bael fruit in being one-celled and divided more or less into five compartments.

AURANTII FRUCTUS.—Bitter Orange.—

The ripe fruit of Citrus vulgaris (Citrus Bigaradia).

N.O.—Rutaceæ.

Habitat.—India ; largely cultivated in South Europe, etc.

Characters.—Globular except at the two ends, where it is somewhat compressed ; about the size of the sweet orange, but the pericarp is rougher, darker in colour, being deep orange-red or red, the pulp very bitter and sour, and the rind more aromatic and very bitter.

Chemistry.—The rind contains volatile oil (*see below*) three glucosides—*hesperidin* ($C_{22}H_{26}O_{12}$), *isohesperidin* and *aurantiamarin* (the bitter principle), and resin, etc. The juice contains citric acid, but in less proportion than is found in lemons. The seeds contain a bitter principle.

Uses, etc.—The rind as Aurantii Cortex (*see below*) ; the juice in the preparation of orange wine.

B.P. Preparations.

Tinctura Aurantii Recentis -	6 of fresh peel in 20 of rectified spirit.
*Vinum Aurantii - - - -	containing 10-12 per cent. of alcohol.

**Used in preparing* Vinum Ferri Citratis and Vinum Quininæ.

Preparations other than B.P.

Oleum Aurantii Corticis is the volatile oil extracted, by means other than distillation, from the fruits of the bitter and sweet orange (C. vulgaris yields *Essence de Bigarade*, C. aurantium, *Essence de Portugal*); it is a pale yellowish, strongly dextro-rotary liquid of S.G. ·840 to ·860, and consists almost entirely of a terpene, *hesperidine* ($C_{10}H_{16}$). The oil is an ingredient of several elixirs included in the U.S.P.. B.P.C.F., etc.

Note.—The unripe fruits (berries) of the orange tree are, or were used, like the leaves, in preparing *oil of petit grain*, and formerly "issue peas" were turned from them.

AURANTII CORTEX—Bitter-Orange Peel.

The dried outer part of the rind, or pericarp, of Citrus vulgaris (Citrus Bigaradia).

N.O.—Rutaceæ.

Syn.—Aurantii Pericarpium.

Habitat.—The South of Europe.

Characters.—In thin pieces, or in curled bands or strips, glandular, and of a deep orange red colour externally and white within, from a portion of the inner spongy part of the rind not having been removed. It has an aromatic bitter taste, and pleasant aromatic odour.

Chemistry.—*See* Aurantii Fructus *above.*

Uses, etc.—As stimulant, tonic, stomachic, and flavouring agent.

B.P. Preparations.

Infusum Aurantii	1 in 20.
,, ,, Compositum	1 in 40.
,, Gentianæ Compositum	110 grains to 1 pint.
Spiritus Armoraciæ Compositus	2½ ounces to 1 pint.
*Tinctura Aurantii	1 in 10 of proof spirit.
,, Cinchonæ Composita	1 in 20.
,, Gentianæ Composita	¾ ounce to 1 pint.

* *Used in preparing* Mistura Ferri Aromatica, Tinctura Quininæ, and Syrupus Aurantii, the latter entering into the composition of Confectio Sulphuris.

BERGAMIA.—Bergamot.—The fruit of Citrus Bergamia.

N.O.—Rutaceæ.

Habitat.—South Europe.

Characters.—Similar in colour to, but smaller than, the lemon; oval or roundish; rind smooth and thin; juice very acid.

Chemistry.—The most important constituent is the volatile oil. *Oil of bergamot* (*essence of bergamot, oleum bergamottæ*) is a fragrant-smelling, green-coloured oil of S.G. ·883 to ·900, it is dextro-rotary and forms a clear neutral solution with twice its volume of 80 per cent. alcohol. It consists of *linalool acetate* ($CH_3COOC_{10}H_{17}$), about 40 per cent., *limonene*, and *bergaptene* ($C_{12}H_8O_4$). The lianalool acetate, which is the valuable constituent, is broken up by age or by distillation of the oil into *linalool* and acetic acid. Like oil of lemon this oil is much adulterated.

Uses, etc.—As a source of the volatile oil, which is best obtained by cold extraction.

LIMETTÆ FRUCTUS.—Lime Fruit.—The fruit of Citrus Limetta.

N.O.—Rutaceæ.

Habitat.—S. Europe; cultivated in West Indies, etc.

Characters.—About half the size of the lemon; with a smoother and thinner rind; oval, rounded at the extremities, and of a pale-yellow or greenish-yellow colour. The rind possesses a fragrant odour, and a warm, aromatic, slightly bitter taste.

Chemistry.—The rind contains a volatile oil (*oil of limes*) and the fruit contains a juice valuable on account of the presence of citric acid (7-8 per cent.)

Uses, etc.—For the production of the juice and the essential oil. The former in addition to being a source of citric acid is much valued as a medicine in scurvy. The oil is used for flavouring purposes.

LIMONIS CORTEX.—Lemon Peel.—The outer part of the rind, or pericarp, of the fresh fruit of Citrus Limonum.

N.O.—Rutaceæ.

Syn.—Limonis Pericarpium.

Habitat.—Southern Europe.

Characters.—Pale-yellow and more or less rough on the outer surface from the presence of glands containing volatile oil, which are imbedded in the tissue beneath; and having but a very small amount of the white spongy portion of the rind on its inner surface. Odour strong, peculiar, and fragrant; taste warm, aromatic, and bitter.

Chemistry.—*Hesperidin*, volatile oil (*see below*), mucilage, albumin, etc

Uses, etc.—Chiefly as a flavouring agent; has stimulant properties.

B.P. Preparations.

Infusum Aurantii Compositum -	112 grains to 1 pint.
,, Gentianæ Compositum -	½ ounce to 1 pint.
Oleum Limonis.	
Syrupus Limonis - - - - -	1 in 20 nearly.
Tinctura Limonis - - - - -	1 in 8 of proof spirit.

OLEUM LIMONIS B.P., the volatile oil of lemon (*essence of lemon*), is obtained from the fresh peel by one of the following methods:—(1) The *flavedo* (or outer rind) is removed by rasping, and afterwards pressed, the oil being received in flasks, which are allowed to stand until the impurities have subsided; thus prepared the product is turbid and does not keep well. (2) The rind is squeezed and the oil received on a sponge, which is pressed when saturated. (3) The *ecuelle* process consists in rupturing the oil-receptacles by superficially grating, or by means of pins, and allowing the oil to drain off. (4) A process adopted for inferior kinds is the same as No. 1, but instead of squeezing the magma, it is distilled with water. When prepared by distillation the oil is colourless and has a better general appearance and keeping quality, but its odour is not so pleasant and sweet. The oil contains about 90 per cent. of terpenes mostly *limonene*, in addition to which an aldehyde, *citral* ($C_{10}H_{16}O$), a stearoptene, and small quantities of other hydrocarbons are present. Citral, which is present to the extent of about 7 per cent., is the valuable constituent.

Oil of lemon has S.G. from ·857 to ·859, and rotates a ray of polarized light about 60° to the right. It is soluble in twelve parts of rectified spirit, in all proportions of absolute alcohol, and an admixture of ten per cent. of the latter is stated to have the effect of preserving its flavour and aroma The oil is much adulterated, chiefly with oil of turpentine, which is difficult to detect, but may sometimes be recognised by the odour left after evaporation of some of the oil from a piece of filter paper; or the oil may be fractionally distilled and an examination of the fractions made.

Oil of lemon is contained in Linimentum Potassii Iodidi cum Sapone, Mistura Olei Ricini, Spiritus Ammoniæ Aromaticus. *Dose.*—1-4 minims.

UVÆ.—Raisins.—The ripe fruit of Vitis vinifera, the Grape Vine. Dried by the heat of the sun, or partly by the sun's heat, and partly by artificial heat. Imported from Spain.

N.O.—Ampelideæ.

Syn.—Uvæ Passæ, Passulæ Majores.

Habitat.—Spain.

Characters.—More or less shrivelled, compressed, smooth, free from sugary or saline incrustation; agreeably fragrant, and with a soft sweet pulp.

Chemistry.—The chief constituents are grape sugar, acid tartrate of potassium, gum, malic acid, with 5 to 6 per cent. tannic acid (the last residing chiefly in the pericarp and integuments of seed). The seeds contain 15 per cent. of a tasteless fixed oil.

Uses, etc.—Chiefly as a flavouring agent.

B.P. Preparations.

Tinctura Cardamomi Composita.
Tinctura Sennæ.

Note.—The varieties of the Grape vine are very numerous, the fruit being an example of the *nuculanium* or superior berry. *Raisins* are dried grapes, and the fruits not being articulated to the rachis, they are in some cases allowed to remain on the vine until dry, when they are known as *Muscatel Raisins*, or raisins of the sun, and these are considered to be the best. *The Lexias* are first dipped into a lye to which oil is added, and subsequently sun-dried. *Valencias* are cut away from the plants, dipped in a boiling dilute lye and afterwards dried. Some raisins of inferior quality are dried artificially. The saccharine substance on the exterior of raisins is the juice which has exuded and candied. *Sultana Raisins* are seedless and come from Smyrna. From the absence of seeds they would be useful in preparing the B.P. tinctures, but they are excluded. The *Spanish* or *Valencia Grapes* are alone official, and hence are chiefly used in the pharmacies, the seeds being removed before use. The currants (*uvæ passæ minores*) of the grocers are really Corinthian Raisins, obtained from a very small variety of grape called the Black Corinth, which is grown chiefly in the Isles of the Grecian Archipelago.

CASSIÆ PULPA.—Cassia Pulp.—The pulp obtained from the recently imported pods of Cassia (Cathartocarpus) fistula.

N.O.—Leguminosæ.

Habitat.—East and West Indies.

Characters.—The pods are from a foot and a half to two feet long, and nearly one inch in diameter, shortly stalked, pointed, blackish-brown, very hard, indehiscent, but the sutures marked by two smooth longitudinal bands; divided internally by thin transverse partitions into numerous cells, each containing a solitary, smooth, flattish-oval, reddish-brown seed, more or less surrounded by pulp, and hence the pods should not rattle when shaken. The pulp is viscid, blackish-brown, sweet in taste, and somewhat sickly in odour. When obtained separately the pulp frequently contains the seeds and the partitions or dissepiments; these should be removed when it is used for pharmaceutical purposes.

Chemistry.—Composed of sugar, pectin, gum and a cathartic principle, probably allied to that of senna.

Uses, etc.—Laxative; usually given with other medicines. *Dose.*—60-120 grains.

B.P. Preparation.

Confectio Sennæ - - - - 1 part in 8, nearly.

Note.—SUBSTITUTIONS, ETC.—CASSIA GRANDIS (BRASILIANA), *Horse Cassia* has legumes which are much longer and larger, one and a half inch in diameter, the valves having very prominent sutures and transverse branching veins. A lighter coloured purging Cassia, which is sometimes met with, is probably obtained from CASSIA MOSCHATA.

St. John's Bread, *Siliqua dulcis*, the fruit of CERATONIA SILIQUA (*N.O.*—Leguminosæ, *Hab.*—S. Europe), has similar constituents to the above, and also has demulcent and laxative properties.

TAMARINDUS.—Tamarind.—The preserved pulp of the fruit of Tamarindus Indica.

N.O.—Leguminosæ.

Habitat.—East and West Indies.

Characters.—A reddish-brown moist sugary mass, enclosing strong, branched fibres and brown shining seeds, each enclosed in a tough membranous coat. Taste agreeable, refreshing, subacid. A piece of bright iron left in contact with the pulp for an hour does not exhibit any deposit of copper.

Chemistry of the Pulp.—Water, citric, tartaric, and malic acids, acid tartrate of potassium, gum, pectin and sugar. Copper is only an occasional accidental impurity. The seeds contain much tannic acid.

Uses, etc.—Refrigerant; laxative. *Dose.*—½ to 2 ounces.

B.P. Preparation.

Confectio Sennæ - - - - - 9 parts in 75.

Note.—Those from West Indies, known as "brown or red" tamarinds, are preserved with moist sugar or in syrup. The East Indian or "black" tamarinds are imported in a dry condition and with portions of the husk.

PRUNUM.—Prune.—The dried drupe of Prunus domestica *var.* Juliana. Imported from the South of France.

N.O.—Rosaceæ.

Habitat.—S. of France.

Characters.—Somewhat ovoid or oblong, about one inch and a quarter long, black, shrivelled; pulp brownish, without marked odour, but with a sweet and somewhat mucilaginous, acid taste.

Chemistry.—In the sarcocarp, sugar 12-25 per cent., pectin, malic acid and salts; the seeds contain fixed oil, emulsin and amygdalin.

Uses, etc.—As nutrititive and laxative.

B.P. Preparations.
Confectio Sennæ - - - - - - - 1 in 12½.

Note.—The prune is an example of the class of fruits known as *drupes.* The drupe is a fruit which has a fleshy exocarp (*sarcocarp*) and a hard, stony endocarp (*putamen*).

ROSÆ CANINÆ FRUCTUS.—Fruit of the Dog-rose. Hips.—The ripe fruit of Rosa canina and other indigenous allied species.

N.O.—Rosaceæ.

Syn.—Fructus Cynosbati.

Habitat.—Britain.

Characters.—Three-quarters of an inch or more in length, ovoid or somewhat oval, smooth, shining, scarlet or red; inodorous; taste pleasant, sweetish, acidulous.

Chemistry.—Citric and malic and a trace of tannic acids, gum, sugar and salts.

Uses, etc.—Refrigerant, slight astringent; largely used as an excipient in pill masses.

B.P. Preparation.
Confectio Rosæ Caninæ.

Note—The fruit of the dog rose consists of an ovoid thalamus or disc (partly derived from the calyx), become dilated and succulent by growth, and containing numerous dry achenes; the latter are rejected in preparing the confection.

RUBUS IDÆUS.—Raspberry.—The fruit of Rubus Idæus.

N.O.—Rosaceæ.

Habitat.—Europe.

Characters.—Deprived of the conical receptacle, and therefore hollow at the base; hemispherical, red, finely hairy, composed of from twenty to thirty coalesced, small drupes, each one crowned with the withered style; juice red; of an agreeable odour and pleasant, acidulous taste.

Note.—The closely allied, light red fruit of Rubus strigosus (wild red raspberry) and the purplish-black fruit of Rubus occidentalis (wild black raspberry) may be employed in place of the above.

Chemistry.—Sugar, citric and malic acids, nitrogenous matter, etc., and a trace of volatile oil.

Uses, etc.—Refrigerant, laxative, etc.; included in the U.S.P. for the production of a syrup.

PIMENTA.—Pimento.—The dried unripe full-grown fruit of Pimenta officinalis (Eugenia Pimenta).

N.O.—Myrtaceæ.

Syn.—Jamaica Pepper, Allspice.

Habitat.—West Indies.

Characters.—Dry, light, roundish, one-fifth of an inch or more in diameter, and crowned with the remains of the calyx in the form commonly, of a raised scar-like ring; pericarp roughish from the presence of oil-glands, brittle, dark-brown, two-celled, each cell containing a brownish-black, somewhat compressed reniform seed. Odour and taste warm, aromatic, and peculiar, but resembling cloves.

Chemistry.—Volatile oil (3 to 4½ per cent.), green oil, resin, and much tannic acid and starch. Ash not more than 6 per cent.

OLEUM PIMENTÆ B.P., the volatile oil, is colourless or slightly yellowish-red, becoming brown by age; S.G. 1·03 to 1·04. It contains *eugenol* (*see* cloves) and a terpene ($C_{15}H_{24}$). The former, which is the valuable constituent, exists to the extent of 60 per cent. and upwards.

Uses, etc.—As stimulant and aromatic. *Dose.*—10-30 grains in powder. Also largely employed for flavouring purposes.

B.P. Preparations.

Aqua Pimentæ	1 in 11½.
Oleum Pimentæ.	

Note.—Allspice is dried by the sun or in kilns. It is a spice, inasmuch as it is chiefly aromatic; a pepper being pungent. It is cultivated in Jamaica in regular walks, called "pimento walks."

GRANATI FRUCTUS CORTEX.—Pomegranate Peel.—The dried peel of the fruit of Punica Granatum.

N.O.—Granateæ (Lythrarieæ).

Habitat.—Europe.

Characters.—In irregular, more or less concave fragments, some of which have the toothed tubular calyx still enclosing the stamens and style. It is one-twentieth to one-tenth of an inch thick, easily breaking with a short, corky fracture; externally it is rough, of a yellowish-brown or reddish colour. Internally, it is more or less brown or yellow, and honeycombed with depressions left by the seeds; it has no perceptible odour, but a strongly astringent taste.

Chemistry.—Tannin 24-30 per cent., sugar gum, and ash (6 per cent.)

Uses, etc.—As astringent, now little used. *Dose.*—15-30 grains in powder or decoction. Formerly included in the U.S.P.

Note.—The fruit of the pomegranate is known as a *balaustra*; it is formed of two rows of carpels placed above each other and surrounded by the calyx, the seeds being attached irregularly to the walls or centre.

COLOCYNTHIDIS PULPA.—Colocynth Pulp.—The dried peeled fruit, freed from seeds, of Citrullus Colocynthis.

N.O.—Cucurbitaceæ.

Syn.—Bitter Apple.

Habitat.—Smyrna, Trieste, France, and Spain.

Characters.—As imported it is usually in more or less broken balls, which are whitish, about two inches or less in diameter, roundish, very light, spongy, tough, and consisting of the pulp in which the seeds are imbedded. The broken-up pulp freed from seeds is the condition in which it is usually supplied to pharmacists, and in which state only is it official. This pulp is light, spongy, whitish, without odour, but with an intensely bitter taste. The powder is not coloured blue by iodine, and does not yield oil when treated with ether and the separated ether evaporated.

Note.—The above tests are intended to detect added starch and what is a much more likely adulterant—unremoved seeds. Nearly three-fourths of the peeled fruit consists of seeds which may be detected not only by means of the fat (15-20 per cent.) which they contain, but also by the microscope, which reveals the albuminous granules of their cotyledons. The most carefully prepared pulp usually contains a small percentage of seeds. The pulp is said (Squire) to yield 8-14 per cent. of ash, the seeds 2-4 per cent. The *Pulvis Colocynthidis* of commerce contains a large proportion of seeds.

Chemistry.—A glucoside, *colocynthin* (¼ to 1 per cent.), which is the active principle. It is soluble in water, more so in alcohol, and insoluble in ether. There are also present—extractive matter, fixed oil, resin (insoluble in ether), gum, lignin, etc. Starch and tannic acid are absent.

Uses, etc.—As cathartic and aperient. *Dose.*—2-8 grains.

B.P. Preparations.

Extractum Colocynthidis Compositum, 1 part to 4½, nearly.
Pilula Colocynthidis Composita - - 1 part in 6, nearly.
,, ,, et Hyoscyami - 1 part in 9, nearly.

Note.—Colocynth also comes from Mogadore, but this kind is usually larger than the official kind, of a darker colour externally, and is not peeled; its seeds have also a darker testa.

LUFFA.—Gourd Towel.—The fruit deprived of its epidermis and parenchymatous tissue, split and dried, of Luffa Egyptiaca, etc.

N.O.—Cucurbitaceæ.

Habitat.—India and Egypt.

Characters.—A durable skeleton of interwoven, woody fibres.

Uses, etc.—In place of sponge.

ECBALII FRUCTUS—Squirting Cucumber Fruit.—The fruit, very nearly ripe, of Ecballium Elaterium; from plants cultivated in Britain.

N.O.—Cucurbitaceæ.

Habitat.—Europe; cultivated in Britain.

Characters.—Ovoid-oblong, nodding, about one and a half inches long, with numerous short, fleshy prickles terminating in white, elongated points. Attached by a long, scabrous peduncle, fleshy and green when young, yellowish when mature; three-celled, with numerous oblong seeds lodged in a bitter succulent pulp. At the time of ripening, the fruit becomes disengaged from the stalk, and the seeds and juice are forcibly expelled at the point of articulation.

Uses, etc.—For the preparation of Elaterium.

B.P. Preparation (of Ecbalii Fructus).
Elaterium.

ELATERIUM B.P. (Extractum Elaterii) is described as a sediment from the juice of the Squirting Cucumber fruit. It is obtained by pressing out the juice, allowing it to deposit, filtering out the deposit and drying it on porous piles. Thus obtained, it occurs in light, friable, flat or slightly curved opaque cakes, about one-tenth of an inch thick; pale-green, greyish-green, or yellowish-grey, according to age; fracture finely granular; odour faint, tea-like, taste bitter and acrid. Does not effervesce with acids; boiled with water and the cooled mixture treated with iodine, affords little or no blue colour; yields half its weight to boiling rectified spirit. Treated by the method described for "Elaterin," it should yield twenty-five per cent., or not less than twenty per cent., of that substance. It contains in addition to Elaterin, chlorophyll, starch, lignin, ash, etc., and bodies named respectively *ecballin*, *prophetin*, *hydro-elaterin*, and *elateride* have also been described. Elaterium is used as a powerful cathartic in doses of $\frac{1}{16}$-$\frac{1}{2}$ grain.

B.P. Preparation (of Elaterium).—Elaterinum.

ELATERINUM ($C_{20}H_{28}O_5$) the active principle of Elaterium, is obtained by exhausting with chloroform, adding ether to the chloroformic solution, collecting the precipitate, washing it with ether and purifying by recrystallizing from chloroform. It is a neutral substance, occurring in small colourless crystals, insoluble in water, soluble in rectified spirit. It has a bitter taste, and, when heated with access of air, melts and then burns, leaving no residue. With carbolic acid it yields a solution which, on the addition of sulphuric acid, acquires a crimson colour, rapidly changing to scarlet. It is not precipitated from solution by tannic acid, nor by the salts of mercury or of platinum.

Uses, etc.—Similar to Elaterium. *Dose.*—$\frac{1}{40}$-$\frac{1}{10}$ grain.

B.P. Preparation (of Elaterinum).
Pulvis Elaterini Compositus - - - - - - 1 in 40.

APIUM.—Celery Fruit.—The dried fruit of Apium graveolens.

N.O.—Umbelliferæ.

Habitat.—Levant, S. Europe; cultivated.

Characters.—About one-twenty-fifth of an inch long, roundish, ovate, laterally compressed, brown, smooth, mostly divided into the two mericarps, and these with five filiform ribs, flat on the face and containing twelve oil tubes; aromatic.

Chemistry.—Volatile oil (S.G. ·88), fixed oil and mucilage,

Uses, etc.—Carminative, stimulant; used for flavouring.

CARUI FRUCTUS.—Caraway Fruit.—The dried fruit of Carum Carui.

N.O.—Umbelliferæ.

Habitat.—Britain and Germany.

Characters.—The fruit is usually separated into its two constituent mericarps, which vary from about one-sixth to one-fourth of an inch in length; they are slightly curved, somewhat tapering at each end, brown, with five paler longitudinal ridges, and in each of the intervening spaces there is a large and conspicuous vitta. Odour agreeably aromatic; taste pleasant, sweetish, and spicy.

Note.—The fruit of the Umbelliferæ is known as a *cremocarp*. It is inferior, dry, indehiscent, two-celled and two-seeded. It consists of two equal and more or less symmetrical parts (*mericarps*) joined face to face to a common axis (*carpophore*) which carries at its summit the remains of the stigma. The fruit is usually more or less longitudinally grooved or ridged, the interspaces of the grooves frequently carrying tubes (*vittæ*) containing volatile oil. In commerce, umbelliferous fruits are usually met with in the form of separated mericarps, *e.g.* caraway.

Chemistry.—Volatile oil 4·7 to 5·4 per cent., ash 5-7 per cent.

Uses, etc.—Stimulant, carminative, etc.

B.P. Preparations.

Aqua Carui	1 in 10.
Confectio Opii	1 part in 10, nearly.
,, Piperis	3 parts in 20.
Oleum Carui.	
Pulvis Opii Compositus	1 part in 2½.
Tinctura Cardamomi Composita	1 in 80.
,, Sennæ	1 in 40.

OLEUM CARUI B.P., the volatile oil, consists essentially of about two parts of *carvol* ($C_{10}H_{14}O$) and one of *limonene* ($C_{10}H_{16}$). Carvol, which is a ketone, is the valuable constituent, and is found also in oils of dill and cumin. The oil is pale-yellow in colour, has S.G. ·905 to ·920, and the measure of its value is the percentage of carvol present.

CONII FRUCTUS.—Hemlock Fruit.—The fruit of Conium maculatum, gathered when fully developed, but while still green, and carefully dried.

N.O.—Umbelliferæ.

Habitat.—Britain.

Characters.—About one-eighth of an inch long, broadly ovoid, somewhat compressed laterally, and crowned by the depressed stylopod, dull greenish-gray. As met with in commerce, it consists usually of the separated mericarps, each of which presents five prominent more or less crenated ridges, with the furrows smooth, and without evident vittæ. Reduced to powder, and rubbed with solution of potash, it gives out a very strong and disagreeable odour.

Note.—The crenate ridges and absence of vittæ are important characters for distinguishing this fruit from others of the same natural order.

Chemistry.—*Conine* (·2 to ·8 per cent.), *methyl-conine*, *conhydrine*, a little volatile oil and fixed oil and ash—5 per cent. (*See* Conii Folia.)

Uses, etc.—As anodyne, antispasmodic and narcotic.

B.P. Preparation.

Tinctura Conii	1 in 8 of proof spirit.

Note.—CONINE $C_8H_{17}N$ or C_5H_{10} $(C_3H_7)N$ is a colourless, volatile, oily liquid, having a S.G. ·886, and boiling point 170° C. It has a disagreeable penetrating mouse-like odour and biting taste. It is slightly soluble in water (1 in 180), freely in alcohol and ether (1 in 6), and being powerfully alkaline, neutralizes the strongest acids perfectly, forming uncrystallizable or very deliquescent salts. Its chloride, however, is not deliquescent. On exposure to air it evolves ammonia, becomes brown, and thickens to a semi-solid, owing to rapid absorption of oxygen. It dissolves silver chloride. Sulphuric acid causes it to assume a purplish-red, turning to olive-green; nitric acid, a blood red and gaseous hydrochloric acid, an indigo blue. It may be obtained by passing superheated steam into the powdered fruits, previously macerated in solution of sodium carbonate. The distillate which contains the alkaloid is neutralized with hydrochloric acid and may be rendered alkaline and treated with ether or alcohol which dissolves out the conine. Conine has been synthetically prepared by the reducing action of sodium on allyl-pyridine C_5H_4 $(C_3H_5)N$, and is hence regarded as having the constitution of an *α-normal propyl-piperidine.*

CORIANDRI FRUCTUS.—Coriander Fruit.—The dried ripe fruit of Coriandrum sativum.

N.O.—Umbelliferæ.

Habitat.—Britain.

Characters.—Nearly globular and consisting of two closely-united hemispherical mericarps, crowned by the calyx teeth and stylopod, about one-fifth of an inch in diameter, brownish-yellow, hard, faintly ribbed with both primary and secondary ridges, the two mericarps enclosing a lenticular cavity, and each furnished on its commisural surface with two brown vittæ. It has an agreeable, mild aromatic taste, and when bruised a pleasant odour.

Chemistry.—Volatile oil (6 per cent.), fat (3 per cent.), mucilage, ash (5-7 per cent.), etc.

Uses, etc.—Stimulant, aromatic, stomachic. *Dose.*—20-60 grains.

B.P. Preparations.

Confectio Sennæ - - - - - - - -	1 part in 25.
Oleum Coriandri.	
Syrupus Rhei.	
Tinctura Rhei - - - - - - - - - -	1 in 80.
,, Sennæ - - - - - - - - -	1 in 40.

OLEUM CORIANDRI B.P., the volatile oil obtained in Britain by the distillation of the fruit is pale-yellow or colourless, having the odour of the fruit and a mild aromatic taste. It has S.G. ·870 to ·885; it is freely soluble in glacial acetic acid, in rectified spirit, and in 75 parts of proof spirit. It consists almost entirely of *coriandol* $(C_{10}H_{18}O)$. It is contained in Syrupus Sennæ.

CUMINUM.—Cumin Fruit.—The fruit of Cuminum Cyminum.

N.O.—Umbelliferæ.

Habitat.—North-eastern Africa; cultivated.

Characters.—Oblong, five or six millimetres long, narrowed at both ends, laterally compressed, brown, rough-hairy; each mericarp with five filiform, yellowish ribs, four broader ones of a brown colour, and six vittæ; odour and taste peculiar, somewhat like caraway.

Chemistry.—Volatile oil (upwards of one per cent.), fixed oil, resin, mucilage, ash, etc.

Uses, etc.—Stimulant, anti-spasmodic, carminative. *Dose.*—10-30 grains in powder. The source of Oil of Cumin.

Oleum Cymini, the volatile oil, is limpid, pale-yellow in colour, of S.G. 0·945. It consists of cymene ($C_{10}H_{14}$), *cuminol* (*cumin aldehyde*, $C_{10}H_{12}O$), and a terpene, ($C_{10}H_{16}$). Cymene, which is methyl-propyl-benzine, may be prepared by the reduction of camphor.

ANISI FRUCTUS.—Anise Fruit.—The dried fruit of Pimpinella Anisum.

N.O.—Umbelliferæ.

Habitat.—Europe.

Characters.—Anise fruits, with the exception of those of the Russian variety, which are shorter, average about one-fifth of an inch in length; they are ovoid-oblong in form, of a greyish-brown colour, and their whole surface is covered with short hairs. Their two constituent mericarps are united and attached to a common stalk; and each mericarp is traversed by five pale, slender, entire ridges, and its transverse section exhibits about fifteen vittæ. They have an agreeable aromatic odour, and a sweetish spicy taste.

Note.—There are three varieties in commerce. (1) Alicante (S.E. of Spain); (2) German; (3) Russian. They are placed in the order of merit. The last is much smaller than the others, being about the size of conium fruits; it has persistent footstalks, and the mericarps remain united, are covered with minute hairs, and have a fancied resemblance to small mice.

Chemistry.—Volatile oil (1-3 per cent.), fixed oil, sugar, mucilage, ash (7 per cent.)

Uses, etc.—Stimulant, carminative, etc.

B.P. Preparations.

Aqua Anisi - - - - - - - - - - - - 1 in 10.
Oleum Anisi.

Oleum Anisi B.P., the volatile oil, is obtained by distilling the fruits in Europe; it is colourless, or pale yellow, of S.G. ·980 to ·990, and solidifies on cooling to a temperature of 15° C., or a few degrees below. It is soluble in three parts of rectified spirit, and in all proportions of absolute alcohol. It may be distinguished from the oil obtained from star anise (*see* Ansi Stellati Fructus) by giving a deep-blue colour on the addition of saturated solution of hydrochloric acid gas in alcohol. The principal constituent of both European and Chinese oil of anise is *anethol* ($C_{10}H_{12}O$), which on oxidation by age, etc., becomes converted into anisic aldehyde; oil of anise enters into the composition of Tinctura Camphoræ Composita and Tinctura Opii Ammoniata.

FŒNICULI FRUCTUS.—Fennel Fruit.—The dried fruit of cultivated plants of Fœniculum capillaceum (Fœniculum vulgare).

N.O.—Umbelliferæ.

Habitat.—S. Europe.

Characters.—From one-fifth to about two-fifths of an inch long, oblong or ovoid-oblong, more or less curved, capped by a conspicuous stylopod and two styles, smooth, greenish-brown or brown ; odour aromatic ; taste aromatic, sweet and agreeable. The fruit is readily separated into its two mericarps, each of which has five predominant ridges of which the lateral are the broadest, and four vittæ in the grooves and two on the commissure.

Note.—Varieties of Fennel.—Saxon or German fennel-fruit is about one-quarter of an inch long, and of a brownish tint. The Roman variety is nearly twice as long, and of a distinctly greenish tint. Fœniculum dulce is only a variety of Fœniculum vulgare. This fruit is the largest of the official cremocarps.

Chemistry.—Volatile oil (upwards of 2 per cent.), fixed oil, sugar, mucilage, ash (7-9 per cent.)

Uses, etc.—Stimulant, aromatic, carminative.

B.P Preparations.

Aqua Fœniculi - - - - - - - - - - -	1 in 10.
Pulvis Glycyrrhizæ Compositus - - -	1 in 12.

Oleum Fœniculi, the volatile oil, is included in the Pharmacopœia of the U.S. and in many of those of the European Continent. It is a colourless, pale-yellowish liquid, having a mild, spicy taste and the characteristic aromatic odour of fennel. The S.G. of the oil is ·960 or higher, and it usually solidifies when reduced in temperature to 50° C. It is soluble in alcohol and glacial acetic acid. In constitution it is similar to the volatile oil of anise (*q.v.*), but it contains less anethol and more hydrocarbon.

ANETHUM.—Dill Fruit.—The fruit of Anethum (Peucedaum) graveolens.

N.O.—Umbelliferæ.

Habitat.—South Europe ; cultivated.

Characters.—Oblong or oval, about four millimetres long, dorsally compressed, brown, smooth, usually separated into the two thin mericarps, and these with six vittæ and five ribs of which three are filiform and the two lateral ones broadly winged and light coloured ; odour and taste spicy, caraway-like.

Chemistry.—Volatile oil (3 per cent.), fixed oil, mucilage, ash, etc.

Uses, etc.—Stimulant, aromatic, carminative ; used in flatulency of infants.

B.P. Preparations.

Aqua Anethi - - - - - -	1 in 10.
Oleum Anethi.	

Oleum Anethi B.P., the volatile oil, is of a pale-yellow colour, pungent odour and pungent and sweetish taste ; has S.G. ·890 to ·920 and is soluble in alcohol and ether. In constitution it is similar to oil of caraway, consisting of terpenes, chiefly limonene, with carvol, the latter in less proportion than is found in the caraway oil.

PETROSELINI FRUCTUS.—Parsley Fruit.—The fruit of Petroselinum sativum (Apium Petroselinum).

N.O.—Umbelliferæ.

Habitat.—South Europe.

Characters.—About one-twelfth of an inch long, ovate, laterally compressed, greenish or brownish grey, smooth, mostly divided into the two mericarps, and these with five filiform, pale-coloured ribs, flat on the face and containing six oil tubes; odour and taste aromatic.

Chemistry.—Volatile oil (1-3 per cent., consisting of a hydrocarbon and a camphor), fixed oil, resin, *apiin* (probably a glucoside), mucilage, ash, and *apiol.* Apiol is an oily, non-nitrogenous body, insoluble in water, unattacked by alkalies and soluble in alcohol.

Uses, etc.—Carminative, stimulant, diuretic. *Dose.*—10-30 grains in powder, etc.

Note.—The activity of the fruit is probably due to the volatile oil, and the value of apiol also probably depends upon the amount of volatile oil associated with it. Commercial apiol is said to consist in many cases chiefly of this constituent.

AJOWAN.—Ajowan Fruit.—The fruit of Carum (Ptychotis) Ajowan.

N.O.—Umbelliferæ.

Habitat.—India, Persia, Egypt.

Characters.—About one-twelfth of an inch long, ovate, laterally compressed, grey-brown, rough and finely warty, usually divided into the two mericarps, and these with five thin ribs, flat on the face and with six vittæ; odour aromatic, thyme-like; taste pungent, aromatic.

Chemistry.—Volatile oil, containing cymene and thymol.

Uses, etc.—One of the officially-named sources of thymol (*see* Thymol).

PHELLANDRIUM.—Water-dropwort.—The fruit of Œnanthe Phellandrium.

N.O.—Umbelliferæ.

Syn.—Five-leaved water-hemlock.

Habitat.—Europe and Northern Asia.

Characters.—Oblong or oblong-ovate, one-sixth to one-fifth of an inch long, nearly terete, brown or blackish brown, smooth, each mericarp with five broad and obtuse ribs, four narrow grooves and six vittæ; odour caraway-like, but pleasant; taste aromatic, bitter and somewhat acrid.

Chemistry.—Volatile oil, fixed oil, resin, etc.

Uses, etc.—Diaphoretic, stimulant, diuretic, etc. *Dose.*—15-60 grains in powder or infusion.

CAROTA.—Carrot-fruit.—The fruit of Daucus Carota.

N.O.—Umbelliferæ.

Habitat.—Northern Asia and Europe; cultivated.

Characters.—About one-sixth of an inch long, oval, dorsally compressed, grey-brown, each mericarp with six thin vittæ, and nine ribs, of which five are hairy and four beset with long spiny bristles; odour slightly aromatic; taste pungent.

Chemistry,—Volatile oil consisting of a hydrocarbon ($C_{10}H_{16}$), and a body probably identical with cineol.

ANGELICA.—Angelica Fruit.—The fruit of Angelica (Archangelica) officinalis.

N.O.—Umbelliferæ.

Syn.—Garden Anglica.

Habitat.—Central and N, Europe, N. Asia.

Characters.—Oblong, from one-sixth to one-fourth of an inch in length, light-yellow or yellowish-green in colour, usually separated into mericarps, each having five wing-like ridges and an indefinite number of vittæ; odour and taste pleasantly aromatic.

Chemistry.—Volatile oil (containing a hydrocarbon *terebangelene*, etc.), *angelic acid*, valeric acid, sugar, bitter principle, starch, etc.

Uses, etc.—As aromatic tonic. *Dose.*—30-60 grains.

LAURI FRUCTUS.—Bay Berries.—The fruit of Laurus nobilis

N.O.—Laurineæ.

Syn.—Baccæ Lauri.

Habitat.—Indigenous to the Levant; grows wild in the countries bordering the Mediterranean.

Characters.—The so-called bay berries are oval drupes, about one-third of an inch long, oval, having a brownish-black, friable, somewhat wrinkled, thin pericarp, enveloping a solitary loose, oval seed, which mainly consists of two fatty cotyledons, of a brownish colour, having an aromatic, oily, and bitter taste.

Chemistry.—Volatile oil (consisting of hydrocarbons, pinene, cineol, etc), fixed oil, resin, etc.

Uses, etc.—Chiefly for the production of the expressed oil (*see below*).

OLEUM LAURI EXPRESSUM (Oleum Laurinum) is obtained in South Europe by steeping the bruised fruit in hot water, and subsequently pressing. This process yields 20-25 per cent. of a fat having a lard-like granular appearance and an aromatic odour and taste. It melts at about 100° C., and is soluble in ether, partly so in alcohol, and does not yield its colouring matter to water. It consists of volatile oil, *laurin*, the stearic ether of *lauric acid*, etc. Lard and similar fats coloured with turmeric and indigo have been used as adulterants and substitutions.

Note.—The fruit of LAURUS BENZOIN (the Canadian *spice bush*) contains much fat and a fragrant volatile oil, and that of LAURUS PERSEA (Persea gratissima), the South American *alligator pear*, contains a butyraceous fat, and is eaten like butter.

FICUS.—Fig.—The dried fruit of Ficus Carica.

N.O.—Moraceæ.

Habitat.—South of Europe.

Characters.—The fig consists of the enlarged hollow succulent receptacle, bearing very numerous seed-like achenes on its inner surface. It is compressed, irregular in form, soft, tough, more or less translucent, brownish or yellowish, and covered with a saccharine efflorescence. Taste, luscious; odour, fruity and pleasant.

Chemistry.—Glucose, fat, albumin, gum, saline matter, and water.

Uses, etc.—Nutritive, laxative, demulcent.

B.P. Preparation.

Confectio Sennæ.

Note.—The fruit of the fig is a *sycon*, and consists of a concave fleshy thalamus in which are embedded numerous achenes.

MORUS.—Mulberry.—The ripe fruit of Morus nigra.

N.O.—Moraceæ.

Habitat.—Asia; cultivated.

Characters.—The fruit is a shortly-stalked, spurious berry (*etærio*), oblong, an inch in length, and, when ripe, of an intense purple colour; each consists of a mass of agglomerated drupes, enclosing a hard, lenticular nucule, covering a pendulous seed, with curved embryo and fleshy albumen.

Chemistry.—Glucose, albumin, pectin, colouring matter, tartaric and malic acids, ash, etc.

Uses, etc.—Refrigerant, laxative, etc. The juice prepared from it is included in the B.P.

CAPSICI FRUCTUS.—Capsicum Fruit.—

The dried ripe fruit of Capsicum fastigiatum (distinguished in commerce as Guinea Pepper and Pod Pepper).

N.O.—Solanaceæ.

Habitat.—Zanzibar.

Characters.—From about half to three-quarters of an inch long, and a quarter of an inch in diameter; somewhat shrivelled, oblong, conical, obtuse, and composed of a smooth shining brittle thin translucent pericarp, of a dull orange-red colour, enclosing several small (nearly white) roundish or ovoid flat seeds. Taste of both pericarp and seeds intensely pungent; odour peculiar and pungent.

Chemistry.—*Capsaicin* $C_9H_{14}O_2$ (colourless, crystalline, volatile, highly acrid, soluble in ether, alcohol, benzol, glacial acetic acid and fats, etc.), red-colouring matter, fats, resin, and ash 4-5 per cent. A volatile alkaloid resembling conine is also said to be present.

Uses, etc.—In medicine as stimulant, etc., internally; as rubefacient, externally. Its chief application is, however, for the production of the powder *(Cayenne pepper)* and as an ingredient of sauces, etc.

B.P. Preparation.

Tinctura Capsici - 1 in 27, nearly, of rectified spirit.

Preparations other than B.P.—Tinct. Capsici Turnbull and B.P.C. [Linimentum Capsici] (1 in 3), Oleo-resina Capsici (*Capsicin*) U.S.P. (an ethereal extract), Emplastrum Capsici, U.S.P. and Unguentum Oleo-Resinæ Capsici, B.P.C. (two latter made from Oleo-resin.)

CAPSICI ANNUI FRUCTUS.—Chillies.—The fruit of Capsicum annuum.

N.O.—Solanaceæ.

Habitat.—Zanzibar; cultivated.

Characters.—About two inches long, pear-shaped or conical, with a dark orange, leathery, shining and shrivelled pericarp, having at the base the remains of the calyx and often a portion of the stalk. Inodorous, but possessing a very pungent taste.

Chemistry.—*See* Capsici Fructus *above.*

Uses, etc.—Chiefly in condiments, etc.

Note.—C. FRUTESCENS has a fruit similar to that of C. FASTIGIATUM, ovate-oblong, one-third to one-half inch long, and one-eighth to one-sixth inch thick.

LUPULUS.—Hop.—The dried strobiles of Humulus Lupulus from plants cultivated in England.

N.O.—Urticaceæ.

Syn.—Humulus.

Habitat.—Britain; cultivated.

Characters.—More or less compressed and broken in commercial specimens. When entire, about one inch and a quarter long; oblong-ovoid or rounded in form, and consisting of a number of thin, greenish-yellow or brownish membranous, imbricated scales or bracts; each of which has at its base a small rounded achene sprinkled over with brownish-yellow glands (lupulin), the whole being attached to a hairy, undulated axis. Odour agreeably aromatic; taste bitter, aromatic, and feebly astringent.

Chemistry.—Volatile oil (containing a sesquiterpene, $C_{15}H_{24}$), bitter principle (*lupulin*, *lupulite*), resin, tannin, trimethylamine, wax (myricyl palmitate), volatile alkaloid (*lupuline*), ash (6-7 cent.) The tannin *(humulo-tannic acid)* is resident in the per scales, which themselves contain but traces of the remaining constituents of the strobile, these being present in the glands (Lupulinum). The volatile oil of hops is said to develop valeric acid on exposure.

Uses, etc.—Internally stomachic, sedative; used also in the form of fomentation or poultice; much used for brewing purposes.

B.P. Preparations.

Extractum Lupuli - -	alcoholic and aqueous; yield, about 30 per cent.
Infusum Lupuli - - -	1 in 20.
Tinctura Lupuli - - -	1 in 8 of proof spirit.

Note.—Hops are picked in September, dried by artificial heat in kilns, and packed in large, long bags or pockets. Those which have been subjected to the treatment of "sulphuring" are not to be used in pharmacy. This process is conducted with a view of improving the colour and odour of hops, since sulphurous acid is found to retard the production of the valerianic odour, and to both preserve and improve the colour of the hops.

CANNABIS FRUCTUS.—Hempseed.—The ripe fruit of Cannabis sativa.

N.O.—Urticaceæ.

Habitat.—Asia; widely cultivated.

Characters.—Each so-called seed is a roundish-ovate achene about one-sixth of an inch long; the pericarp is greenish-grey or brown, and encloses a single oily seed.

Chemistry.—Fixed oil, 30-35 per cent.; albuminoids, 16 per cent., etc.

Uses, etc.—As cattle food, and for the production of the fixed oil.

Note.—It is only the hemp obtained from the East which has narcotic constituents (*see* Cannabis Indica).

CUBEBA.—Cubebs.—The dried unripe full-grown fruit of Piper Cubeba (Cubeba officinalis).

N.O.—Piperaceæ.

Syn.—Tailed pepper.

Habitat.—Java.

Characters.—Globular, about one-sixth of an inch in diameter, blackish or greyish-brown, much wrinkled, and tapering below into a rounded stalk which is continuous with, and permanently attached to, the pericarp. Beneath the shrivelled skin is a hard brown, smooth shell in which the seed is contained in the mature fruit, but in commercial cubebs this seed is mostly so little developed that the pericarp is nearly empty. Taste warm, aromatic, and somewhat bitter; odour strong, peculiar, and aromatic. A decoction when cold is coloured bright indigo-blue by solution of iodine. Crushed cubebs give a crimson colour with concentrated sulphuric acid.

Chemistry.—Volatile oil (5-15 per cent.), *cubebine* (inodorous, crystalline, bitter), resin (3 per cent.), *cubebic acid* (1 per cent.), fat, wax, starch, ash (5-6 per cent.) Cubebic acid is the valuable constituent.

Uses, etc.—Cubebs have a stimulant and carminative action, owing to the volatile oil which they contain; but the chief value of the drug is due to the cubebic acid, which has diuretic properties.—*Dose.*—30-120 grains.

B.P. Preparations.

Oleo-resina Cubebæ.
Oleum Cubebæ.
Tinctura Cubebæ - - - 1 in 8 of rectified spirit.

Oleum Cubebæ, B.P., the volatile oil distilled in Britain from cubebs, is limpid, colourless, or greenish-yellow, becoming thicker on keeping. It has S.G. ·910 to ·930, is lævorotatary, is soluble in 18 parts of rectified spirit and in all proportions of absolute alcohol. It consists of a mixture of terpenes, two of which (sesquiterpenes) form crystalline hydrochlorides. Oil distilled from long-kept cubebs deposits crystalline *cubeb-camphor*.

Note.—Varieties, Adulterations and Substitutions of Cubebs.—The fruit as met with in commerce always contains some proportion of the nearly inodorous rachis an excess of this must be regarded as an adulterant.

The natives of Java recognise three varieties of the cubeb plant, viz., Rinoe katoentjar, Rinoe badak and Rinoe tjaroelock, and the following adulterations and substitutions have from time to time been noted.

Cubeba (Piper) Clusii (*African cubebs, Ashantee pepper*) has a fruit one-third smaller than the official cubebs, tastes like black pepper, and contains not cubebin but piperin.

Piper ribesioides has a fruit larger than cubebs, with long flattened foot-stalk, less agreeable odour, and less pungent but bitter taste. It is best distinguished by its histological characters.

Piper Crassipes has a fruit similar to, if not identical with, the above; like the latter, it gives a reddish-brown, not a crimson colour, with concentrated sulphuric acid.

Daphnidium Cubeba (*N.O.*—Lauraceæ) has a cubeb-like berry which, however, possesses a distinctive and lemon-like odour, and readily splits into its two oily cotyledons. In powder it gives a yellowish-brown (not crimson) colour with concentrated sulphuric acid. Holmes refers this plant to Litsea (Tetranthera) citrata, the source of the so-called "citronelle fruits."

Cubebs with a mace-like odour are sometimes met with in commerce; these are probably derived from Piper (Cubeba) lewong, a native of Java, and are similar in appearance to, but somewhat larger than, the fruits of Piper Clusii.

For article on cubebs and their adulterations, with plates, see *P.J.* [3], xxv, p. 314 *et seq*

PIPER NIGRUM.—Black Pepper.—The dried unripe fruit of Piper nigrum.

N.O.—Piperaceæ.

Habitat.—East Indies; cultivated.

Characters.—Roundish, usually about one-fifth of an inch in diameter; pericarp thin, blackish-brown, wrinkled, and containing a hard, smooth, roundish seed of a yellowish-brown or grey colour. Odour aromatic; taste pungent and bitterish.

Chemistry.—Volatile oil (1 to 2 per cent., isomeric with oil of turpentine, non-pungent), ***piperidine*** (volatile alkaloid), an acrid, soft resin, ***piperin***, fat, starch and ash (at most 6 per cent.) Piperidine ($C_5H_{11}N$) is soluble in water and alcohol, and forms crystalline salts with acids. Piperin ($C_{17}H_{19}NO_3$) is a neutral principle, found in black pepper and other peppers. It occurs, when pure, in colourless, transparent, sublimable crystals, insoluble in water, soluble in alcohol, ether, etc., and is resolved by alkalies into ***piperic acid*** and piperidine. The pungent taste and odour and medicinal activity of pepper appear to be due to the presence of the volatile oil and soft acrid resin.

Note.—Piperine has been prepared artificially from piperdine and piperic acid. Piperidine is of interest chemically as being *hexa-hydro pyridine*.—(*See* note on Conine).

Uses, etc.—Carminative, stimulant, and mild ferbifuge. *Dose.*—5-20 grains in powder.

B.P. Preparations.

Confectio Opii - - - - - -	1 part in 31.
,, Piperis - - - - -	1 part in 10.
Pulvis Opii Compositus - - - -	1 part in $7\frac{1}{2}$.

Preparations other than B.P.—Oleo-resina Piperis, Piperinum (U.S.P.), (*see above*). *Heliotropin* (*Piperonal*), used in perfumery, may be prepared from piperic acid.

Note.—ADULTERATION OF PEPPER.—This is practised chiefly on the powder, and may be usually detected by means of the microscope. *Poivrette* or *pepperette*, a reputed adulterant, is said to consist of ground olive stones. The starch of pepper has distinctive characters.

PIPER ALBUM.—White Pepper.—The ripe fruit of Piper nigrum, more or less deprived of the pericarp.

N.O.—Piperaceæ.

Habitat.—East Indies.

Characters.—Globular, smooth, with ten or twelve veins from base of apex, whitish, containing an albuminous seed, having small starch grains; odour and taste pepper-like, but less pungent than black pepper.

Chemistry.—Similar to that of black pepper, but containing less of the active principles, more starch, and from 1-2 per cent. only of ash.

Uses, etc.—As black pepper, but less frequently.

PIPER LONGUM.—Long Pepper.—The dried unripe spike (catkins) of Chavica Roxburghii and Piper officinarum.

N.O.—Piperaceæ.

Habitat.—Java, Bengal, etc., the best coming from Batavia and Singapore.

Characters.—The spike of immature, closely packed, coalesced berries forms a long, nearly cylindrical body, one to one and a half inch in length. The white colour is due to lime, its natural colour being brown.

Chemistry, uses, etc.—Analogous to those of black pepper.

JUNIPERI FRUCTUS.—Juniper Fruit.—The fruit of Juniperus communis.

N.O.—Coniferæ.

Habitat.—England, etc..

Characters.—Nearly globular, about one-third of an inch in diameter, dark purplish and covered with a whitish bloom; the short stalk at the base contains one or two whorls of the small scales, and the apex is marked by three radiating furrows, which are surrounded by ridges, enclosing a triangular space. The three bony seeds are ovate in shape, triangular above, and imbedded in a brownish pulp, containing oil-cells. Odour aromatic and somewhat balsamic; taste sweet, terebinthinous, bitterish and slightly acrid.

Chemistry.—Volatile oil (1-2 per cent.), wax, resin, *juniperin* (resin-like), gum, sugar, mucilage, ash, etc.

Uses, etc.—For the production of the volatile oil (*see* Oleum Juniperi); occasionally made use of in the form of an infusion; largely used in the manufacture of gin.

Note.—The fruit of the Juniper is a *galbulus*, *i.e.*, a modification of the *strobilus* (cone) with enlarged, fleshy scales.

CARDAMOMUM.—Cardamoms.—The dried ripe seeds of the Malabar Cardamom, Elettaria (Alpinia, Amomum) Cardamomum. The seeds are best kept in their pericarps, in which condition they are imported; but when required for use they should be separated and the pericarps rejected.

N.O.—Zingiberaceæ.

Habitat.—Malabar.

Characters.—About one-sixth of an inch long, irregularly angular, transversely wrinkled, dark reddish-brown externally, whitish within; odour and taste agreeably warm and aromatic. The pericarps in which they are enclosed vary from about two-fifths of an inch to nearly an inch long, and from about one-fifth to two-fifths of an inch broad; they are ovoid or oblong, obtusely triangular, shortly beaked, rounded at the base, brownish-yellow, longitudinally striated, and without taste or odour.

Three varieties are known to commerce, viz.:—(1) "Shorts" (official); (2) "Short longs," from seven-tenths to nine-tenths of an inch long; (3) "Long longs," from nine-tenths to a little more than an inch long.

Chemistry.—Fixed oil (10·4 per cent.), volatile oil (4·6 per cent.), an acrid resin, ash (5·6 per cent.) The S.G. of the volatile oil is 0·930.

Uses, etc.—Carminative, stimulant, usually given with other medicines. *Dose of seeds.*—5 to 20 grains.

B.P. Preparations.

Extractum Colocynthidis Compositum,	1 part in 27, nearly.
Pulvis Cinnamomi Compositus	1 part in 3.
,, Cretæ Aromaticus	1 part in 44.
*Tinctura Cardamomi Composita	1 in 80.
,, Gentianæ Composita	1 in 80.
,, Rhei	1 in 80.
Vinum Aloes	80 grains to 1 pint.

**Contained in* Decoctum Aloes Compositum, Mistura Ferri Aromatica, Mistura Sennæ Composita, Tinctura Chloroformi Composita.

Preparations other than B.P.—Tincture (simple) U.S.P., Tinctura Carminativa (B.P.C.F.)

Varieties of Cardamoms :—

Ceylon Cardamoms, from Elettaria major, are one and a half inch long, acutely triangular, with flat sides and attenuated apex ; colour darker than the official.

Round Cardamoms, from Amomum cardamomum and A. globosum (from Java, Siam, China, etc.) are of the size of a cherry, globular or ovoid, with three convex sides.

Bengal Cardamoms, from Amomum aromaticum, are one inch long, oblong or oval, with nine wings near the apex.

Nepal Cardamoms are similar to the above, with a long beak-like calyx ; origin unknown.

Winged Java Cardamoms, from Amomum maximum, are globose, one inch long, obtusely triangular, with three or four short membranous wings on each side.

VANILLA.—Vanilla.—The prepared unripe fruit of Vanilla planifolia.

N.O.—Orchideæ.

Habitat.—Indigenous to Eastern Mexico; cultivated widely in the tropics.

Characters.—From six to ten inches long, linear, narrowed and bent or hooked at the base, rather oblique at the apex ; wrinkled, somewhat warty, dark-brown, glossy, leathery, one-celled, and containing a blackish-brown pulp, with numerous minute seeds, and more or less acicular crystals ; odour and taste peculiar and fragrant.

Mexican Vanilla is the best ; other varieties are known as Bourbon, Seychelles, Mauritius, South American and Tahiti Vanillas.

Chemistry.—Fixed oil, soft resin, bitter extractive, sugar, starch, and benzoic acid. The odorous principle, which is frequently to be seen whitening the surface of the pods, is a crystalline body with a hot, biting taste, having the constitution of the methyl-ether of protocatechuic aldehyde, and is known as *vanillin* ($C_8H_8O_3$). It is freely soluble in alcohol, ether and chloroform, difficultly in cold water. It has been prepared synthetically from *coniferin*, a glucoside found in the sap of conifers ; it has also been prepared from guaiacol, but its chief source is eugenol.

Uses, etc.—In medicine obsolete ; the U.S.P. includes a tincture ; largely used for flavouring and perfumery. For the latter purposes, preparations of Vanilla are preferred to the artificially prepared vanillin.

HORDEUM DECORTICATUM.—Pearl Barley.—The dried seed of Hordeum distichon, divested of its integuments. From plants cultivated in Britain.

N.O.—Gramineæ.

Habitat.—Britain.

Characters.—White, rounded, with a trace of the longitudinal furrow, in which are the remains of the yellowish-brown integuments. Taste and odour farinaceous, like the cereal grains generally.

Note.—The fruits of the cereals and of the grasses generally are frequently spoken of as seeds, on account of their having the pericarp completely and inseparably attached to the seed. *Scotch, Hulled, or Pot Barley* consists of the grain with the husk partly removed by a mill. *Patent Barley* is the ground, decorticated grain. *Pearl Barley* is the grain, minus its integuments, rounded and polished, and is the official kind.

Chemistry.—Water, 14·9 per cent.; nitrogenous matter (including gluten, etc.), 7·6 per cent.; fat, 1 per cent.; carbohydrates, 75·1 per cent.; fibre, 0·6 per cent.; ash, 0·8 per cent.

Uses, etc.—In medicine, as nutrient and demulcent.

B.P. Preparation.

Decoctum Hordei - - - - - - - 1 in 10, about.

Maltum, Byne, is the seed of Hordeum distichum caused to enter the incipient stage of germination by artificial means, and dried. The process of *malting* barley, which begins by *steeping* and ends in drying, is conducted with the view of developing the largest quantity possible of the fermentive principle, *diastase*, the formation of which is the first step in the process of germination. Diastase, like the ferment found in saliva, has the property of converting starch suspended in water into a mixture of dextrin, and *maltose*; germinated barley contains about 6·2 per cent. of diastase, and this body is capable of converting about two thousand times its weight of starch. Diastase is a white, tasteless solid, soluble in water and in dilute alcohol, destroyed by a temperature above about 72° C. Malt also contains a second ferment, *peptase*, which has the power of converting proteids into peptones. The chief use of malt is for brewing purposes. Medicinally, it is given in the form of an extract, prepared by evaporating an aqueous infusion *in vacuo*.

PHALARIS.—Canary Seed.—The fruit of Phalaris canariensis.

N.O.—Gramineæ.

Habitat.—Coasts of the Mediterranean.

Characters.—About one-sixth of an inch long, ovate or elliptic, flattened, enclosed by glossy, yellowish-gray paleæ, after the removal of which the fruit is smooth and brownish and internally white. Inodorous, tasting slightly bitter.

Chemistry.—Starch, gluten, sugar, fat, etc.

Uses, etc.—Nutritive and emollient; has been used for poultices chiefly; employed as food for birds; has also been eaten by man.

ANNOTTA.—Annatto.—The dried, prepared pulp of the fruit of Bixa Orellana.

N.O.—Bixaceæ.

Syn.—Annotto.

Habitat.—Tropical America, East and West Indies.

Characters.—Plastic, or, when dry, hard and brittle, of a blood-red colour, becoming brown on exposure; odour peculiar; taste saline, disagreeable. Annatto softens in water, but is insoluble therein; it is soluble in alkalies, ether, alcohol, and oils.

Note.—There are two varieties imported, viz., *Spanish Annatto*, coming from Brazil, which is hard and brittle, odourless, and usually in rolls. *French* or *Flag Annatto*, coming from Cayenne, which is bright yellow in colour, firm and soft to the touch, and usually in square cakes.

Chemistry.—Annatto contains a yellow, crystalline, colouring matter, *bixin*, soluble in alkalies and reprecipitated by acids.

Uses, etc.—For colouring varnishes and lacquers; as a dye-stuff for cotton, silk and wool; for the production of cheese and butter colouring. Butter colouring is best obtained by dissolving one part of an alcoholic extract in ten parts of olive oil.

Note.—Annatto is frequently adulterated with *e.g.*, ochre, sand, gypsum, and farinaceous substances. A fictitious annatto, with Venetian red as a basis, has been met with.

CHENOPODIUM.—American Wormseed.—The fruit of Chenopodium ambrosioides var anthelminticum.

N.O.—Chenopodiaceæ.

Habitat.—Indigenous to West Indies, Central and South America.

Characters.—Nearly one-twelfth of an inch in diameter, depressed, globular, glandular; dull-greenish or brownish, the integuments friable, containing a lenticular, obtusely-wedged, glossy-black seed. It has a peculiar, somewhat terebinthinate odour, and a bitterish, pungent taste.

Chemistry.—A reliable analysis of the plant is needed. It contains a volatile oil.

Uses, etc.—As vermifuge; official in the U.S.P. for the preparation by distillation of Oleum Chenopodii. Employed under the name of *Herba Santa Maria* as anthelmintic, and in pectoral complaints. *Dose.*—15-45 grains in powder or infusion.

Note.—*Jerusalem Oak* is the product of C. BOTRYS, and is said to have similar properties to the above.

DIOSPYRUS.—Persimmon.—The unripe fruit of Diospyros embryopteris.

N.O.—Ebenaceæ.

Habitat.—Common in forests throughout India.

Characters.—About the size of a small apple, of a yellowish rusty colour, covered with a rubiginous farina; eight seeded, abounding with a viscid, very astringent, juice.

Chemistry.—Tannic acid, malic acid, sugar, and pectin.

Uses, etc.—As astringent, tonic, and febrifuge; included in the Indian Pharmacopœia. *Dose.*—15-60 grains in infusion or tincture.

RHUS GLABRA—Sumach.—The fruit of Rhus glabra, collected in early autumn.

N.O.—Anacardiaceæ.

Habitat.—North America.

Characters.—Sub-globular, about one-eighth of an inch in diameter, drupaceous, crimson, densely hairy, containing a roundish-oblong, smooth putamen. It is inodorous, and its taste acidulous.

Chemistry.—Tannic acid (1 to 2½ per cent.), a little gallic acid, fixed and volatile oil.

Uses, etc.—As astringent and refrigerant. Official in the U.S.P. for the production of a fluid extract. The bark, which contains tannic acid (8 to 15 per cent.), is used by tanners.

PHYTOLACCA.—Poke Berry.—The fruit of Phytolacca decandra; collected in August.

N.O.—Phytolaccaceæ.

Habitat.—North America.

Characters.—A depressed-globular, dark-purple, compound berry, about one-third of an inch in diameter, composed of ten carpels, each containing one lenticular, black seed; juice, purplish-red; inodorous; sweet, slightly acrid.

Uses, etc.—Alterative, laxative, emetic. *Dose.*—5-15 grains in infusion. Official in the U.S.P. for the production of a fluid extract.

RHAMNI CATHARTICÆ FRUCTUS.—Buckthorn Fruit.—The ripe fruit of Rhamnus catharticus.

N.O.—Rhamnaceæ.

Habitat.—Britain (Hertfordshire chiefly).

Characters (of Dry Fruits).—About the size of a pea, black and shining; at the apex is seen the remains of the style, at the base a portion of the persistent calyx. Each contains four hard, dark-brown, grooved, one-seeded nuts or achænia. The cotyledons and albumen are of a horseshoe shape. Taste, bitter; odour, nauseous.

Chemistry.—Rhamnocathartin (yellow, amorphous, soluble in water, golden-yellow with alkalies), *rhamnin* (*chrysorhamnine*), sugar, gum, tannin, etc. Rhamnin is a yellow, crystalline glucoside, soluble with a reddish-yellow colour in alkalies, and decomposable into *rhamnetin* and a sugar.

Uses, etc.—For the preparation of the juice. Succus Rhamni (formerly official) is a liquid of a green colour when fresh, but is coloured red by acids (and hence by fermentation through keeping), yellow by alkalies; it has a bitter taste and a nauseous odour. It has a strongly purgative action, and is largely given to dogs. A medicinal syrup is prepared from it, and the pigment, *sap-green*, is obtained by evaporating it to dryness with an alkali.

ANACARDIUM.—Cashew-nut.—The fruit of Anacardium occidentale (Cassuvium pomiferum).

N.O.—Anacardiaceæ.

Habitat.—Tropical America.

Characters.—Reniform, about one inch long, three-quarters of an inch broad, and two-fifths of an inch thick; grey-brown, finely punctate, having two shells with a black juice between them, and enclosing an oily kernel.

Chemistry.—Cardol (oily, acrid, poisonous), anacardic acid, tannin, gum, etc.; the seeds contain a bland fixed oil.

Uses, etc.—The juice as vesicant, etc.; the seeds as a food.

Note.—The *Oriental Cashew-nut*, obtained from SEMECARPUS ANACARDIUM (*Hab.*—India), is ovate, heart-shaped, and has similar properties to the above.

MYROBOLANUS.—Myrobolan.—The fruit of various species of Terminalia as T. Chebula, T. Citrina, etc.

N.O.—Combretaceæ.

Habitat.—India.

Characters.—One to one and one half inches long, oblong or ovoid, obtusely five or six-angled and ribbed, yellowish-brown, the endocarp pale-brown and resinous dotted, containing a white seed.

Chemistry.—Tannin (about 40 per cent.), *myrobolanin* (a resin), *chebulinic acid.* In the seeds a fixed oil.

Uses, etc.—Formerly much employed as an astringent, now rarely used except for tanning purposes.

RANDIA.—Randia.—The dried ripe fruit of Randia dumetorum.

N.O.—Rubiaceæ.

Habitat.—India.

Characters.—About the size of a crab apple, round, two-celled, many-seeded, and crowned with the rim of the calyx. It has a peculiar, sweetish, sickly smell, and an at first sweet, but afterwards nauseous taste.

Chemistry.—Randia-saponin, randic acid (similar to quillaic acid), tannin, fat, etc.

Uses, etc.—Emetic, antispasmodic. Used by natives of India as former; has been recommended in tincture as latter.

HIBISCI FRUCTUS.—Hibiscus Fruit.—The fresh immature capsules of Hibiscus (Abelmoschus) esculentus.

N.O.—Malvaceæ.

Syn.—Gombo.

Habitat.—West Indies.

Characters.—Four to six inches in length, about an inch in diameter at the base; tapering, furrowed; somewhat bristly, particularly at the ridges, which correspond in number with that of the cells and valves, viz., from five to eight, with a single row of smooth round seeds in each cell; very mucilaginous.

Chemistry.—Pectin, starch, mucilage, etc.

Uses, etc.—For preparing emollient poultices; also much employed in thickening soups, etc. It is an article of diet in the tropics.

SILYBI FRUCTUS.—Mary Thistle Fruits.—The fruits of Silybum Marianum.

N.O.—Compositæ.

Syn.—Semen cardui Mariæ.

Habitat.—S. Europe.

Characters.—Achenes one-sixth to one-fifth inch in length, not curved, obovate, flattened, smooth, glossy, light-brown with black or blackish striæ, oblique at the apex and crowned by a yellowish margin, from the centre of which the base of the style projects; inodorous, taste mucilaginous and somewhat bitter.

Chemistry, uses, etc.—Similar to those of Carduus benedictus (*q.v.*)

MEZEREI FRUCTUS.—Mezereon Fruit.—The fruit of Daphne Mezereum.

N.O.—Thymelaceæ.

Syn.—Fructus coccognidii.

Habitat.—S. Europe.

Characters.—Berry-like, in the fresh state red, globular, ovate or oval, about one-fifth of an inch thick; after drying, brown or black, wrinkled; containing a glossy black seed; inodorous, but having a strongly acrid, burning taste.

Chemistry.—Gum, vegetable acids, protein compounds, drying oil (30 per cent.) and *coccognin* which, unlike daphnin, is not a glucoside, and sublimes unchanged.

Uses, etc.—The fruits possess a narcotico-acrid action.

9. BARKS.—CORTICES.

General Histological Characters of Barks.—Bark may be defined as an integument of dead tissue covering the stems and roots of dicotyledons. Its formation is brought about by the activity of a cambium-like subepidermal layer of cortex cells (*cork-cambium*, or *phellogen*), which, by division, surrounds itself with a layer of cork, the tissues external to this subsequently dying; these dead tissues together with the cork constituting the bark. In the very young stem, root, or branch the phellogen layer is formed not very far down in the cortex, with the result that the epidermis is caused to crack and peel off, being replaced by the layer of primary cork, but later in life the cork-producing layers may be formed so far down in the cortex that they cut out the deeper-lying tissues of the phloëm or bast, including the medullary rays. By the activities of annually-appearing layers of phellogen, not formed concentrically, successive layers of cork are produced, resulting in the accumulation of overlying thin sheets of cortex and cork proper; these layers being gradually driven outwards by the increase in thickness of the stem or root, at length crack and form a fissured bark, frequently composed of irregular scales, which gradually fall away by decay. The relative thinness of the bark of very old stems and branches is due to this gradual exfoliation of their outlying portions.

The bark is commonly spoken of as consisting of an inner and an outer portion. The *inner bark, liber* or *endophlœum* is practically identical with the bast or phloëm, whilst the *outer bark* consists of two layers, an inner parenchymatous *mesophlœum* and an outer *epiphlœum* consisting of cork cells and synonymous with the periderm ; the two latter layers not infrequently slough off, and the external layer then consists of the liber with an external jacket of cork.

In addition to the above-named structures the outer layer of the bark has local interruptions in the form of pores, the so-called *lenticels*. These, which are best observed in the young bark, appear as biconvex swellings of the periderm, and serve the function of an interchange of gases with the environment.

In distinguishing amongst barks the most important characters to be noted are—the colour and texture, internal and external; the nature of the fracture (short or fibrous, etc.); the presence or absence of the periderm, of fungi and of lichens. The barks made use of in medicine are, in the majority of cases, those of stems, and the pieces may be in either quills or flat pieces, the quill condition being brought about by the shrinkage through drying, of the inner surface of the bark.

General Chemical Characters of Barks.—The bark is sometimes regarded as being the receptacle of the excretory products of the plant, and the commonest form of the latter being some form of tannin, this body is almost invariably present. In addition to this there are found many other substances, some of them highly useful in medicine, *e.g.*, resins, volatile oils, bitter principles, alkaloids, glucosides, etc.

CINCHONÆ CORTICES.—Cinchona Barks.—The dried bark of Cinchona Calisaya, Cinchona officinalis, Cinchona succirubra, Cinchona lancifolia, and other species of Cinchona from which the peculiar alkaloids of the bark may be obtained. Some species of Remijia may be used for obtaining salts of quinine and cinchonine (B.P.)

N.O.—Rubiaceæ.

Syn.—The Countess' powder; Jesuit's bark (Pulvis Jesuiticus); Lignum Febrium; Pulvis Patrum; Cortex Peruanus (P.L. 1677); Chinchona Bark; Quinquina (F.); Cortex Chinæ (P.G.); Quina, which is the Peruvian term for *bark*, is equivalent to the Spanish *cascarillo* and the South American *cascara.*

Habitats.—These evergreen trees, or shrubs, are indigenous to the mountainous districts of South America (Andes), but are largely cultivated with success in India (Neilgherry Hills), Ceylon, and Java.

Classification.—Many systems have been used, but that of the 1867 Pharmacopœia was founded on the difference of colour. The three chief divisions are pale, yellow, and red. The present British Pharmacopœia only admits of one kind for preparations, the dried bark of the stem and branches of cultivated plants of Cinchona succirubra, thus doing away with the still popular classification above named.

Collection.—In South America the trees are felled and stripped. The small quills from the twigs and branches are dried in the sun, and the large pieces from the trunk are removed and piled in layers, crossing each other at right angles, pressed down with weights, and dried by exposure. The periderm of the calisaya variety is removed by beating with mallets. The *serons* used for packing the bark for exportation consist of fresh hides, which, by contracting as they dry, form a firm package. In India there are several methods of obtaining the bark. (1) *Karsten's method* (mossing).—Removal of narrow longitudinal strips, and covering the trunk with moss. The bark grows again and becomes "renewed bark." (2) *Coppicing.*—After cutting the tree down above the root, and removing the bark, the remaining stumps develop shoots, from which the bark may be removed in a few years. (3) *Moen's method* (shaving).—The *outer layers* of bark are removed by a spokeshave, and the denuded part protected by grass; moss, or other means.

Medical History.—Associated with its introduction as a medicine are the Countess of Cinchon (1638), Chifflet, (1653, circa), and the Jesuit Fathers (1655). It was known in England in 1655, and appears in the London Pharmacopœia of 1677.

Botanical History.—Linnæus gave this genus the name of Cinchona in honour of the Countess of Cinchon, who is said to have introduced the bark into Europe in 1638. La Condamine first described the plant in 1737. Other personal observers were Jussieu (1739); Mutis (1772); Ruiz and Pavon (1777); Humboldt and Bonpland (1792); Poppig (1832); Weddell (1846); and more recently Markham and others. The other genera closely allied to the Cinchonas are:—Exostemma, Buena, and Cascarilla. There are about thirty species of Cinchona, and the following are considered to be the most valuable:—

[*Continued on page 148.*

TABULATED CHARACTERS OF THE FOUR CHIEF CINCHONA BARKS.

	Loxa, Pale or Crown.	*Yellow.*	*Red.*	*Columbian Carthagena.*
Botanical Source ...	C. OFFICINALIS ...	C. CALISAYA	C. SUCCIRUBRA	C. LANCIFOLIA.
Habitat	Loxa in Ecuador (Huanuco, Jæn, Huamilies).	Bolivia and South Peru...	Cultivated in India, Ceylon and Java	Botoga (New Granada).
Part used and how met with.	Whole bark always in single quills.	Liber or (rarely) quills ...	Coated quills, or incurved pieces.	Fine large quills, or thick, flattish, or curved pieces (half quills).
Thickness	$\frac{1}{24}$ to $\frac{1}{12}$ inch.	$\frac{1}{6}$ to $\frac{1}{3}$ inch	$\frac{1}{10}$ to $\frac{1}{4}$ inch	$\frac{3}{4}$ inch.
Length	6 to 15 inches	6 to 18 inches	2 to 12 inches or more ...	1 or 2 to 21 inches.
Diameter or width ...	$\frac{1}{6}$ to $\frac{2}{3}$ inch; not larger than the finger.	Pieces, 1 to 3 inches; quills as large as the thumb.	$\frac{1}{2}$ to 2 inches	Pieces, 4 to 5 inches; quills, $\frac{1}{4}$ to $1\frac{1}{2}$ inch.
Texture	Brittle, easily splitting longitudinally.	Compact and heavy ...	... ...	Soft.
Transverse Fracture...	Short	Shortly and finely fibrous.	In smaller quills, nearly close; in larger quills, finely fibrous.	Very fibrous.
Interior	Bright orange or cinnamon-brown.	Tawny-yellow, fibrous ...	Brown-red, or deep reddish brown; irregularly and coarsely striated.	Stringy, very fibrous, reddish-brown or orange-red.

Exterior	Brown and wrinkled, or grey and speckled, with adherent lichens, with or without numerous transverse or branching cracks. Periderm not easily peeled off.	Brown, marked by broad, shallow, irregular, longitudinal depressions (digital furrows), with lichens not loose. Quills, with a few large, longitudinal cracks. The periderm readily peels off.	More or less rough, from longitudinal furrows or ridges, or transverse cracks, or annular fissures and warts; and brownish or reddish-brown in colour.	Often silvery and velvety, from pubescent periderm; corky and easily indented with the nail; no furrows. Red Carthagena has small pits or shot-like depressions.
Powder	Pale yellow; highly bitter; very astringent.	Cinnamon brown; somewhat aromatic; persistently bitter.	Brownish or reddish-brown; no marked odour; taste bitter and somewhat astringent.	Reddish-yellow; not very bitter taste.
Composition	Cinchonine, quinidine, or cinchonidine and but little quinine.	Chiefly quinine, with very little cinchonine.	Chiefly cinchonidine (2 to 3 per cent.); with little quinine (1 to 2 per cent.); little or no quinidine; and cinchonine and amorphous alkaloid (2 to 4 per cent.)	Quinine, quinidine, and cinchonine.
Ash	2 to 3 per cent.	0·58 per cent.	0·3 per cent. to 3·5 per cent.	0·3 per cent. to 3.0 per cent.
Imported	In serons or boxes, *ex.* Payta.	In serons, bales, or boxes, *ex.* Arica, Islay, and Lima.	Bales	In serons or boxes, *ex.* Carthagena.

(1) Cinchona calisaya (yielding *yellow bark*).
(2) Cinchona officinalis *var.* (*a*) Condaminea, (*b*) Bonplandia, (*c*) Crispa (yielding *crown* or *Loxa bark*).
(3) Cinchona Succirubra (yielding *red bark*).
(4) Cinchona lancifolia, Cinchona cordifolia (yielding *Colombian*, *Carthagena* or *Coquetta bark*).

The average altitude is 5,000 to 8,000 feet above sea level. (1) Cinchona Calisaya.—A lofty tree, with trunk two or more feet in diameter, growing in the warmest woods at a height of 6,000 to 7,000 feet above sea level. Leaves variable in form, three to six inches long; flowers pinkish, in large pyramidal panicles, fragrant; fruit, a capsule dehiscing from below upwards (characteristic of the genus). There are three varieties: (*a*) Cinchona morada, (*b*) Cinchona verde, (*c*) Cinchona amarilla vel fina. (2) Cinchona officinalis, formerly Cinchona condaminea *var.* (*a*) crispa, (*b*) chahuarguera (B P., 1867), is a large tree, having lanceolate or ovate leaves, usually pointed, glabrous and shining; flowers small, pubescent, and in short lax panicles; fruit half-inch or more in length; the source of the crown bark of Loxa. (3) Cinchona succirubra.—Fifty to eighty feet high; leaves broadly ovate, about twelve inches long, pubescent beneath; flowers in terminal panicles, rose-coloured. (4) Cinchona lancifolia.—*See tabulated scheme.*

Commercial History.—Almost exclusively obtained in early times from Loxa, shipped at Payta, whence to Spain, and thence spread all over Europe. Supplies came to England first about 1655; in 1753 it was found in New Granada; in 1776 Huanuco was an additional source, and since this period barks were, and are still, shipped from the ports of Guayaquil, Payta, Lima, Arica, Buenos Ayres, Carthagena, and Santa Martha. Attempts were made in 1737 to transplant the Cinchonas, but without much success. Condamine (1737), Ruiz (1792), Fée (1824), Fritze (1837), Royle (1837), Miquel (1846), Weddell (1848), each advised Cinchona cultivation in other parts of the world, and in 1852-6, Hasskarl, for the Dutch Government, sent some plants and seeds to Java, where their cultivation was commenced. In 1859, Markham, for the British Government, sent plants to India (the Neilgherry Hills), Ceylon, and other places, where the plants have flourished.

Other Cinchona Barks.—A large number of commercial varieties have appeared in the market, made up frequently of the barks of different species, and therefore difficult to characterize. This difficulty is greater with the small quills, but even the old barks of botanical varieties of the same species often present considerable differences in their physical and histological characters. Brief descriptions of the most important varieties are given below:—

Cinchona cordifolia (Weddell) yields *hard Carthagena bark.* Occurs in large quills without periderm; sometimes of a tea-green tint and wrinkled longitudinally, having a short, not fibrous fracture. The flat pieces are hard, thin, somewhat curved, and of a tea-green or maroon tint, with the remains of a white periderm and small, flat, pale-brown warts (lenticels). Taste bitter and nauseous.

Cinchona Pitayensis.—This supplies *Pitayo bark.* It occurs in flattish or curved pieces, about one-quarter of an inch thick, covered with a nearly smooth, soft, brownish, ochre-coloured cork, marked with nearly circular scars; the bast layer is of a bright reddish-cinnamon colour, and breaks with a short splintery fracture. The powder is of a brighter yellow tint than that of Calisaya bark. Its chief use is for the manufacture of quinine and quinidine. It is imported from New Granada (Mount Pitayo, near Popayan). It contains a large proportion of resin.

Cinchona pubescens.—*Cusco bark* is obtained, in part at least, from this species, and occurs in pieces similar to the preceding; but the corky layer is pale-brown-yellow or whitish and warty, the bast layer cinnamon-coloured, and the fracture smooth on the outside and coarse splintery in the inner layer. Some varieties yield the alkaloid, *aricine.*

Cinchona Rubiginosa, a variety of Cinchona lancifolia, yields a bark having a deeper-red colour, which is much used in the manufacture of quinine.

Cinchona Peruviana, Cinchona Nitida, Cinchona Micrantha, and perhaps other species, yield the silver-grey, *Lima*, or *Huanuco barks.* The bark of the last-mentioned is the most valuable of the three, and may be recognised by its rusty coat with a thin silvery layer beneath it, having very few transverse cracks. It is much used on the continent. *Habitat.*—Peru, and cultivated in India. As they usually consist of a mixture of the quilled branch barks, the physical characters must vary with the prodominance of the different species. The same remark applies also to *Huamilies bark*, to which Cinchona micrantha, glandulifera, purpurea, (Ruiz et Pavon), and other species contribute, and to the various grey barks of commerce.

Cinchona Tucujensis yields *Maracaibo bark*, which is yellow, hard, and contains but little alkaloid.

Common Characters of Cinchona Barks.—While the difficulty of distinguishing amongst the varieties of Cinchona barks is often considerable, if not insurmountable, there are certain characters by means of which a Cinchona bark may be known as such. "The shape of the commercial bark depends upon its treatment during the drying process, and the cultivated bark is generally seen in fairly uniform quills. The outer surface of the bark of old wood is influenced in appearance by the presence or absence of the corky layer, which in some species is easily detached. The inner surface, if not torn, always presents a striate appearance, which is coarser or finer according to the relative thickness of the bast fibres and their arrangement. The size, arrangement, and relative number of the latter impart to the transverse fracture its peculiar character, and the almost complete absence of these in younger barks causes them to break with a smooth fracture. The density of cinchona barks varies considerably, but, according to Arnaud, is, in most cases, less than that of water—Calisaya bark is, however, slightly heavier than water. The most important characteristics of cinchona barks are due to their bast or liber fibres, which are never branched, are rather short, with their ends obtusely pointed, of a rather quadrangular appearance upon the transverse section under the microscope, showing the secondary deposits of the cell walls by which the central cavity has been almost closed."—*Stillé* and *Maisch.*

Chemical History.—Passing over the early attempts of Fourcroy, Westring, Seguin, Deschamps, Vauquelin, Reuss, Gomez, Laubert, and Dr. Duncan to isolate the active principles of this bark, we find in 1820 Pelletier and Caventou confirm Gomez and Laubert s discovery of cinchonine. They discovered quinine in Calisaya bark. Henry and Delondre (1833) and Winckler (1844) discovered quinidine; Pasteur (1853) discovered cinchonidine, he also showed that quinine and quinidine were isomeric, and that cinchonine and cinchonidine were also isomeric. The change of alkaloidal terminations from *a* and *ia* to *ina* and *ine* is in conformity with the most modern scientific usage.

Chemistry.—The Cinchona and allied barks contain upwards of thirty natural alkaloids, in addition to several others obtained artificially from these. The four most important alkaloids are *quinine*, *quinidine*, *cinchonine*, and *cinchonidine*, (see below). The following is a list of the other natural cinchona alkaloids:—*Quinamine*, *quinamidine* (*conquinamine*), *cupreine*, *homoquinine* (*ultraquinine*), *hydroquinine*, *hydroquinidine*, *hydrocinchonine*, *hydrocinchonidine* (*cinchamidine*), *cinchonamine*, *paytine*, *cusconine*, *concusconine*, *cusconidine*, *aricine* (*cinchovatine*), *paricine*, *paytamine*, *dihomocinchonine*, *dicinchonine*, *diquinidine* (*dicinchonine*), *javanine*, *cincholine*, *chairamine*, *conchairamine*, *chairamidine*, *conchairamidine*. The following are the chief artificial alkaloids:—*Quinicine*, *diquinicine*, *cinchonicine*, *dicinchonicine*, *quinamicine*, *protoquinamicine*, *apoquinamine*, *homocinchonicine*.

The other constituents of the bark are:—*Quinic acid*, $C_7H_{12}O_6$ (*cinchonic*, *kinic acid*), occurring in the bark as calcium salt, crystalline or amorphous, soluble in water, almost insoluble in ether, yielding *quinone* by oxidation ; *quinovin (kinovin*, *chinovin*, *kinovic-bitter)*, white, uncrystallizable, bitter, almost insoluble in water, soluble in ether and alcohol; volatile oil; fat, greenish, saponifiable by alkalies; *cinchofulvic acid* (*cinchona-red*), an insoluble red colouring matter, most abundant in red bark; a yellow colouring matter; *cincho-tannic acid* (*cinchotannin*), the soluble red colouring matter ; a glucoside possessing the characters common to tannins, and yielding by hydrolysis cinchona-red and sugar. *Chinoidine* or *quinoidine* is a term applied to the resinous substances, consisting not only of natural amorphous alkaloids, but those which are produced artifically, through the action of heat and acids upon the crystalline alkaloids.

A simple test for Cinchona barks generally, is to moisten the fine powder with a little acetic acid, and heat strongly in a test-tube, when vapours are evolved which condense as blood-red drops on the side. Hesse modifies this thus:—Extract the alkaloids with acidulated water and evaporate the liquid with the powdered bark and heat as before.

For the B.P. official assay process see under Cinchonæ Rubræ Cortex.

Uses, *etc.*—As tonic and antiperiodic, much used in fevers, etc.

B.P. Preparations.
Quininæ Hydrochloras.
Quininæ Sulphas.
Cinchoninæ Sulphas.
Cinchonidinæ Sulphas.

QUININÆ HYDROCHLORAS, B.P., $C_{20}H_{24}N_2O_2HCl, 2H_2O$, is obtained from the same source, and by the same process as sulphate of quinine (see below), the separated alkaloid being neutralized by hydrochloric acid.

B.P. Preparation.

Tinctura Quininæ - -	1 in 60 of Tincture of Orange.

QUININÆ SULPHAS B.P. (Quinine disulphate) $[(C_{20}H_{24}N_2O_2)_2 . H_2SO_4]_2 . 15H_2O$, is the sulphate of an alkaloid prepared from the powder of various kinds of cinchona and remijia barks by extraction with spirit after the addition of lime, or by the action of an alkali on an acidulated aqueous infusion with subsequent neutralization of the alkaloid by sulphuric acid and purification of the resulting salt. The freshly prepared salt contains 15·2 per cent. of removable water.

B.P. Preparations.

Tinctura Quininæ Ammoniata -	1 grain in 60 minims.
Vinum Quininæ - - -	1 grain in 1 fluid ounce.
Ferri et Quininæ Citras - -	16 per cent.

CINCHONINÆ SULPHAS B.P. $(C_{20}H_{24}N_2O)_2\ H_2SO_4, 2H_2O$, is the sulphate of an alkaloid obtained from the bark of various species of cinchona and remijia. It may be obtained from the mother liquors of the crystallization of the sulphates of quinine, cinchonidine, and quinidine by precipitating the alkaloid with caustic soda, washing it with spirit till free from other alkaloids, dissolving in sulphuric acid, and, after purifying the solution with animal charcoal, allowing to crystallize.

CINCHONIDINÆ SULPHAS B.P. $(C_{20}H_{24}N_2O)_2\ H_2SO_4, 3H_2O$, is the sulphate of an alkaloid obtained from the bark of various species of cinchona. It may be obtained from the mother liquors of the crystallization of sulphate of quinine by further concentration, purified by crystallization from alcohol, and finally from alcohol.

Note.—QUININE (*Quinina*), $C_{20}H_{24}N_2O_2,3H_2O$, the basic substance, occurs as trihydrate, and may be precipitated from its salts by alkalies. It is almost insoluble in water, freely so in rectified spirit, chloroform, and ether. Besides the official salts of quinine there are many others made use of in medicine, amongst which the following may be mentioned:—Quinine acid sulphate (miscalled neutral sulphate, $C_{20}H_{24}N_2O_2 . H_2SO_4,7H_2O$, obtained by adding dilute sulphuric acid to the sulphate), quinine carbolate, citrate, hydrobromate, phosphate, salicylate, valerianate, tartrate, etc.

CINCHONÆ RUBRÆ CORTEX.—Red Cinchona Bark.—The dried bark of the stem and branches of cultivated plants of Cinchona succirubra.

N.O.—Rubiaceæ.

Habitat.—India, Ceylon, and Java.

Characters.—In quills or more or less incurved pieces, coated with the periderm, and varying in length from usually a few inches to a foot or more—the bark itself from about one-tenth to a quarter of an inch thick, or rarely more; outer surface more or less rough from longitudinal furrows and ridges, or transverse cracks, annular fissures, and warts, and brownish or reddish-brown in colour; inner surface brick-red or deep reddish-brown, irregularly and coarsely striated; fracture nearly close in the smaller quills, but finely fibrous in the larger ones; powder brownish or reddish-brown; no marked odour; taste bitter and somewhat astringent.

Test.—When used for purposes other than that of obtaining the alkaloids or their salts, it should yield between five and six per cent. of total alkaloids, of which not less than half shall consist of quinine and cinchonidine, as estimated by the following methods:—

1. *For Quinine and Cinchonidine.*—Mix 200 grains of red cinchona bark in No. 60 powder, with 60 grains of hydrate of calcium; slightly moisten the powders with half an ounce of water; mix the whole intimately in a small porcelain dish or mortar; allow the mixture to stand for an hour or two, when it will present the characters of a moist, dark-brown powder, in which there should be no lumps or visible white particles. Transfer this powder to a six-ounce flask, add three fluid ounces of benzolated amylic alcohol, boil them together for about

half-an-hour, decant and drain off the liquid on to a filter, leaving the powder in the flask ; add more of the benzolated amylic alcohol to the powder, and boil and decant as before; repeat this operation a third time; then turn the contents of the flask on to the filter, and wash by percolation with more of the benzolated amylic alcohol until the bark is exhausted. If, during the boiling, a funnel be placed in the mouth of the flask, and another flask filled with cold water be placed in the funnel, this will form a convenient condenser, which will prevent the loss of more than a small quantity of the boiling liquid. Introduce the collected filtrate, while still warm, into a stoppered glass separator; add to it twenty minims of diluted hydrochloric acid, mixed with two fluid drachms of water; shake them well together, and when the acid liquid has separated this may be drawn off, and the process repeated with distilled water slightly acidulated with hydrochloric acid, until the whole of the alkaloids have been removed. The acid liquid thus obtained will contain the alkaloids as hydrochlorates, with excess of hydrochloric acid. It is to be carefully and exactly neutralised with ammonia while warm, and then concentrated to the bulk of three fluid drachms. If now about fifteen grains of tartarated soda, dissolved in twice its weight of water, be added to the neutral hydrochlorates, and the mixture stirred with a glass rod, insoluble tartrates of quinine and cinchonidine will separate completely in about an hour; and these collected on a filter, washed, and dried, will contain eight-tenths of their weight of the alkaloids, quinine and cinchonidine, which, divided by two, represents the percentage of those alkaloids. The other alkaloids will be left in the mother-liquor.

2. *For total alkaloids.*—To the mother-liquor from the preceding process add solution of ammonia in slight excess. Collect, wash, and dry the precipitate, which will contain the other alkaloids. The weight of this precipitate divided by two, and added to the percentage weight of the quinine and cinchonidine, gives the percentage of total alkaloids.

Chemistry, uses, etc.—See Cinchonæ Cortices *above.*

B.P. Preparations.

Decoctum Cinchonæ - - - - -	1 in 16.
Extractum Cinchonæ Liquidum -	about 1 ounce in 1 fluid ounce; containing 5 per cent. total alkaloids.
Infusum Cinchonæ Acidum - - -	1 in 20.
Mistura Ferri Aromatica - - -	1 in 16.
Tinctura Cinchonæ - - - - -	1 in 5 of proof spirit.
,, ,, Composita -	1 in 10 of proof spirit.

REMIJIÆ CORTEX.—Cuprea Bark.—The bark of Remijia Purdieana and Remijia pedunculata.

N.O.—Rubiaceæ.

Habitat.—Southern and Central Columbia.

Characters.—In pieces varying from half an inch to three to four inches in length; from one-quarter to one-twelfth of an inch in thickness, strong and hard, varying from a yellowish to a reddish cinnamon colour, and having a somewhat cupreous tint, distinctly curled, very smooth on the inner surface, on the outer surface smoothish, or in larger pieces, rough with the epidermis usually adherent, marked, except in the very large pieces, with fine wrinkles and sometimes with transverse or spiral grooves, which are sometimes quite shallow, but often are deeply and sharply cut. Texture dense and hard; fracture short, not fibrous and free from spicules.

Chemistry.—Some varieties yield quinine, others only traces, and cinchonidine is generally absent. The alkaloid *cinchonamine* (0·2 per cent.) was discovered in 1881 by Arnaud in Remijia purdieana and has been employed in the chemical laboratory as a test for nitrates. In some varieties *homoquinine* (0·3 per cent.) which, by means of a 10 per cent. solution of sodium hydrate, is transformed into a mixture consisting of two parts quinine and three parts of *cupreine*, was obtained by Tod (1881), and about the same time, and independently, by Paul and Cownley, Howard, and W. G. Whiffen; the last-named calling it ultraquinine. Homoquinine shows fluorescence, and the thalleioquin reaction like quinine. Cupreine is not fluorescent and is soluble in sodium hydrate solution, but is precipitated by ammonium hydrate: it is also soluble in ether.

Uses, etc.—As a source of the alkaloids which it contains.

BERBERIS CORTEX.—Barberry Bark.—The bark of Berberis vulgaris.

N.O.—Berberideæ.

Habitat.—Europs, Asia.

Characters.—Thin, small, irregular pieces; externally yellowish grey; internally nearly smooth and of an orange-yellow colour; taste bitter.

Chemistry.—*Berberine*, *berbamine*, *oxycanthine* (alkaloids) and another; tannin, wax, albumin, gum, etc., are also present.

Uses, etc.—Tonic, in large doses purgative. *Dose.*—5-10 grains in decoction.

Note.—The root bark of B. Asiatica (*Indian Barberry*) is light-coloured, corky, almost inodorous, with a bitter mucilaginous taste; it contains much berberine, and an extract is made from it; is employed in India under the name of *Rusot.*

SIMARUBÆ CORTEX.—Simaruba Bark, Mountain Damson Bark.—The dried root-bark of Simaruba amara (S. officinalis, S. medicinalis).

N.O.—Simarubaceæ.

Habitat.—Jamaica and South America.

Chemistry.—In broad, folded, very fibrous pieces, several feet long, which are externally rough, warty, and marked with transverse ridges, externally greyish or whitish-yellow in colour; internally pale yellowish-white and striate. Very frequently the outer bark has been removed, when the external surface is pale yellowish or pinkish brown, and marked by fine paler lines due to bast fibres. The liber is very tough, fibrous, and difficult to break transversely. Taste very bitter.

Chemistry.—A bitter principle, said to be quassin, volatile oil, resin, gallic acid, etc.

Uses, etc.—A bitter tonic. *Dose.*—5-20 grains in infusion.

Note.—The bark of SAMADERA INDICA, containing a bitter principle *samaderin*, has similar properties to the above. *Honduras bark* (CASCARA AMARGA) belongs to a species of Picramnia; it contains a sweet-bitter amorphous alkaloid.

EUONYMI CORTEX.—Euonymus Bark.—

The dried root-bark of Euonymus atropurpueus.

N.O.—Celastrineæ.

Syn.—Wahoo-bark.

Characters.—In quilled or curved pieces, varying in thickness from one-twelfth to one-sixth of an inch. The outer surface is light ash-grey in colour, with darker patches, dirty-white where the epidermis has been rubbed off, soft and friable, with occasional rootlets attached. The inner surface, when free from the white wood, is pale, tawny, white and smooth. The bark breaks transversely with a finely fibrous fracture, the middle layer having a laminated appearance; longitudinally the fracture is smooth. Odour faint but characteristic; taste somewhat mucilaginous and afterwards bitter and slightly acrid.

Chemistry.—*Euonymin* (neutral, amorphous, soluble in ether, alcohol and water) *euonic acid*, resins, fat, extractive, dulcitol, etc., ash 14 per cent.

Uses, etc.—As tonic, diuretic, laxative, etc.

B.P. Preparation.—Extractum Euonymi Siccum, made with dilute alcohol; yield, about 25 per cent.

Note.—"Dried extract of Euonymus is commonly known as Euonymin."—B.P. Euonymin was the name originally given to the precipitated resinoid by the eclectics; it must not be confounded with the active principle of the bark. The U.S.P. includes an extract (soft) of Euonymus, and the B.P.C.F. a tincture (1 in 5 of rectified spirit).

CANELLÆ CORTEX.—Canella Bark.—

The bark of Canella alba, deprived of its corky layer and dried.

N.O.—Canellaceæ.

Syn.—White Wood or Wild Cinnamon.

Habitat.—West Indies.

Characters.—In quills or irregular pieces, which are generally more or less twisted and broken longitudinally; it has a pale orange-brown or buff colour externally, is commonly marked by rounded depressions or scars, and sometimes the remains of the corky layer may be seen here and there as silvery grey patches; internally its colour is paler, being whitish or yellowish white. It has an agreeable odour, somewhat resembling a mixture of cloves and cinnamon, and a pungent, bitter acrid taste.

Chemistry.—Volatile oil (containing eugenol), resin, starch, mannite, bitter principle, ash, etc.

Uses, etc.—As aromatic bitter. *Dose.*—10-40 grains in powder; given either alone or mixed with aloes (Pulvis Aloes cum Canella, not official) etc.

B.P. Preparation.—Vinum Rhei - - 60 grains to 1 pint.

Note.—This bark has frequently been sold as Winter's bark.

CINNAMODENDRON CORTEX—Cinnamodendron Bark; False Winter's Bark.—The dried bark of Cinnamodendrom corticosum.

N.O.—Canellaceæ.

Habitat.—Jamaica.

Characters.—Of a ferruginous grey brown colour, darker upon the outer surface, spotted by scars of the nearly circular suberous warts; smooth and finely striated upon the inner surface, and almost agreeing in odour and pungent (not bitter) taste with Canella bark, which has also been sold as true Winter's bark. Its decoction becomes blue on addition of solution of iodine, and black with ferric chloride.

Chemistry.—Probably the same as Canella alba, but contains in addition some tannin, hence it can easily be distinguished from Canella. Drimys bark also contains tannic acid, but an infusion of this is precipitated by barium nitrate and ferrous sulphate solutions. A cooled decoction causes with iodine an intense purple-brown colour, which Drimys bark does not.

Uses, etc.—Like Canella.

GRANATI RADICIS CORTEX.—Pomegranate Root Bark.—The dried bark of the root of Punica Granatum.

N.O.—Granatieæ (Lythrarieæ).

Habitat.—South of Europe.

Characters.—In small quills or fragments, varying from two to four inches in length; outer surface yellowish-grey, wrinkled or cracked with faint longitudinal striæ, or more or less furrowed with corky bands; inner surface smooth or nearly so, yellow; fracture short; no odour; taste astringent and very feebly bitter. An infusion becomes deep blackish-blue on the addition of a persalt of iron.

Chemistry.—*Punico-tannic acid* (22 per cent.) and the alkaloids *pelletierine (punicine)* $C_8H_{13}NO$, *methyl-pelletierine*, *pseudo-pelletierine* and *isopelletierine*. Pelletierine is the most important constituent, is liquid, boils at 125° C. and is soluble in water, alcohol, ether and chloroform.

Uses, etc.—As astringent and anthelmintic. *Dose.*—10-30 grains.

B.P. Preparation.

Decoctum Granati Radicis - - 2 ounces to 1 pint.

Note.—The sulphate and tannate of pelletierine (not pure) are used in medicine.

Adulterations.—Barberry Bark (*N.O.*—Berberideæ) and the bark of the Box-tree (Buxus Sempervirens, *N.O.*—Euphorbiaceæ), both of which are not astringent but are decidedly bitter. A decoction of these gives no blackening with a solution of ferric chloride.

PRUNI VIRGINIANÆ CORTEX.—Wild Cherry Bark.—The bark of the larger branches of Prunus serotina (Cerasus serotina). Collected in autumn.

N.O.—Rosaceæ.

Habitat.—United States of America.

Characters.—In curved pieces or irregular fragments, one-twelfth of an inch or more thick, outer surface greenish-brown, smooth and somewhat glossy, marked with transverse scars ; if collected from old wood and deprived of the corky layer, the outer surface is nut-brown and uneven ; inner surface somewhat striate or fissured. Upon maceration in water it develops a distinct bitter-almond odour ; its taste is astringent, aromatic and bitter. It is readily powdered.

Chemistry.—Tannic acid, gallic acid, resin, bitter principle and starch ; and by distillation yields, as a result of the decomposition of a little *amygdalin*, a volatile oil containing hydrocyanic acid, probably similar to the volatile oil of bitter almonds.

Uses, etc.—Mild sedative, etc. Official in the U.S.P., which includes an infusion and a fluid extract ; the B.P.C.F. has a syrup and a tincture.

QUILLAIA.—Soap Bark.—The bark of Quillaia saponaria.

N.O.—Rosaceæ.

Habitat.—Peru and Chili.

Characters.—Flat, large pieces, about one-fifth of an inch thick ; outer surface brownish-white, often with small patches of brown cork attached, otherwise smooth ; inner surface whitish, smooth ; fracture splintery, checkered with pale brownish bast fibres imbedded in white tissue ; inodorous, very acrid, and sternutatory.

Chemistry.—Much *saponin*, little starch and *sapogenin*. *Quillain* is an alcoholic extract of this bark. *Saponin* $C_{16}H_{30}O_{10}$, found also in SAPONARIA OFFICINALIS and other plants, is a white amorphous powder, soluble in water and in weak alcohol, and has the property of causing frothing with water. It is decomposed by dilute acids into *sapogenin* and a sugar (or *saponetin* and a sugar). Commercial saponin is said to be a mixture of quillaic acid and sapotoxin.

Uses, etc.—As stimulant diuretic and irritant ; as source of saponin. *Dose.*—15-30 grains in infusion.

RUBUS.—Blackberry Bark.—The bark of the root of Rubus villosus, Rubus Canadensis and Rubus trivialis.

N.O.—Rosaceæ.

Habitat.—United States of America.

Characters.—In thin, tough, flexible bands, outer surface blackish or blackish-grey, inner surface pale-brownish, sometimes with strips of whitish, tasteless wood adhering ; inodorous, strongly astringent, somewhat bitter.

Chemistry.—Tannic acid is an abundant constituent (10 per cent.)

Uses, etc.—As astringent and tonic. *Dose.*—30-120 grains. The U.S.P. includes a fluid extract.

CUSPARIÆ CORTEX.—Cusparia Bark.—

The dried bark of Galipea Cusparia (Bonplandia trifoliata).

N.O.—Rutaceæ.

Syn.—Angostura Bark.

Habitat.—Tropical South America.

Characters.—In flattish or curved pieces, or in quills six inches or less in length ; the bark itself commonly not more than one-sixth of an inch thick, and obliquely cut on its inner edge. Coated externally with a yellowish-grey mottled corky layer, which may usually be scraped off by the nail, the exposed surface then presenting a dark brown resinous appearance ; inner surface light brown, flaky, and occasionally with strips of the wood attached. Fracture short and resinous, and exhibiting, more especially when examined by a magnifying lens, numerous white points or lines. Taste bitter and somewhat aromatic ; odour musty and disagreeable. Fractured surface touched with nitric acid does not become of an arterial blood-red colour (absence of false angustura bark).

Chemistry.—Four alkaloids are present, viz., *galipine* (*galipeine*), *galipidine*, *cusparine*, *cusparidine*, also volatile oil, resins and a bitter principle *angosturin*.

Uses, etc.—As aromatic tonic. *Dose.*—5-30 grains.

B.P. Preparation.

Infusum Cuspariæ - - - - 1 in 20.

SUBSTITUTIONS.—(1) *False Angustura Bark* is obtained from the STRYCHNOS NUX VOMICA tree, and is occasionally found mixed with the true drug. This is a dangerous admixture since it contains the alkaloids of nux vomica, viz., strychnine, brucine, etc. The following tabulated statements show the difference between them:—

Character.	*True.*	*False.*
Thickness of pieces ...	One-sixteenth to one-eighth of an inch.	One-eighth of an inch or more.
Texture	Hard	Harder.
External appearance ...	Reddish-brown colour; uneven; and covered with an ochrey-yellow scurfy, and friable cork, which is easily removed by the nail.	Grey, with bright rust-coloured patches of cork and white warts.
Internal appearance ...	Lighter than exterior in colour, and smooth ; separates in lamellæ.	Brown colour ; not separable.
Fracture	Resinous and brilliant (from white striæ of crystals of calcium oxalate).	Smooth and somewhat black.
Taste	Bitter, not lasting	Very bitter and lasting.
Odour	Aromatic, not agreeable ...	None.
Water texture, etc. ...	Imbibes it freely and soon becomes dry; fragile when dry ; very light ; rather spongy.	Remains hard in water ; difficult to break ; very heavy, compact, and is cut with difficulty.
With nitric acid ...	Deep brownish-red ; or like venous blood (absence of brucine).	Arterial blood-red (presence of brucine).

(2) *Copalchi Bark*, which has occasionally been met with since 1855, is the bark of CROTON species, probably Pseudochina. (*N.O.*—Euphorbiaceæ. *Habitat.*—Puntas Arenas, the most southern part of South America). Externally consists of a loose, thin, greyish, papery, suberous layer, which, when removed, exhibits transverse pits like the lines of a file; its fracture is short; taste like cascarilla. There is present in this bark a little volatile oil, bitter principle, and an alkaloid which gives the thalleioquin test characteristic of quinine and quinidine; it does not, however, yield herapathite.*

(3) *Brazilian Angustura Bark* is the bark of ESENBECKIA FEBRIFUGA. (*N.O.*—Rutaceæ.) Externally it is grey-brown or with light rust-brown patches, internally dark brown; fracture short, fibrous; taste bitter, not aromatic; contains *evodine* (*esenbeckine*).

(4) Recently (1894-5) a bark (origin untraced) has been met with as a substitution of angustura bark which has the following characters:—in flat or slightly incurved pieces of varying length and width, and from 1/16 to ⅛th, or rarely as much as ⅜th of an inch, in thickness. The outer surface of a grey-brown colour, rough from the presence of many wart-like excrescences of the periderm, and frequently bearing closely adherent lichens of a yellow or a yellowish-red colour, marked with numerous black spots; beneath the corky layer the colour is dark greenish-grey. The inner surface is coarsely striated longitudinally, and in colour yellow, yellowish-brown, and brown. Fracture hard, brittle, showing numerous closely adherent concentric laminæ. A transverse section under the microscope shows numerous concentrically arranged large groups of schlerenchymatous cells.

* (*See* also note to Cascarillæ Cortex.)

XANTHOXYLUM.—Prickly Ash.—The bark of (1) Xanthoxylum fraxineum (X. Americanum) and of (2) Xanthoxylum carolinianum (X. Clava-Herculis).

N.O.—Rutaceæ.

Characters.—( ) In thin curved or quilled fragments. Externally brownish-grey, with whitish patches and minute, black dots, with some brown, glossy, straight, two-edged spines, about a quarter of an inch long; internally whitish, smooth. Fracture short, inodorous, bitterish, very pungent, ( ) Resembles the preceding, but is thicker and marked by many conical, corky projections, sometimes four-fifths of an inch high, and by stout, brown spines rising from a corky base. Xanthoxylum should not be confounded with the bark of Aralia spinosa, which is nearly smooth externally and beset with slender prickles in transverse rows.

Chemistry.—*Xanthoxylin* (crystalline, bright red with H_2SO_4), a second crystalline body (dark red with H_2SO_4), tannin, sugar, ash, etc.

Uses, etc.—Internally and externally as stimulant; resembles mezereon in action. *Dose.*—10-30 grains in powder. Included in the U.S.P. for the production of a fluid extract.

RHAMNI PURSHIANI CORTEX.—Sacred Bark.—The dried bark of Rhamnus Purshianus.

N.O.—Rhamnaceæ.

Syn.—Cascara Sagrada.

Habitat.—North America.

Characters.—In quills or in-curved pieces of varying lengths and sizes, the bark itself being from one twenty-fifth to one-eighth of an inch thick, smooth or nearly so externally, covered with a greyish-white layer, which is usually easily removed, and frequently marked with spots or patches of adherent lichens. Beneath the surface it is violet-brown, reddish-brown or brownish; and internally reddish-brown or yellowish-brown, and nearly smooth, although somewhat striated longitudinally. Fracture short, except internally, where it is slightly fibrous, more especially in the larger pieces. No marked odour; taste bitter. It is frequently imported in flattened packets, consisting of small pieces of the bark compressed into a more or less compact mass.

Chemistry.—The bark contains several resins, volatile and fatty oils, starch, tannic, malic and oxalic acids. It also contains a body which has been called *cascarin*, and which is said to be identical with the frangulin (rhamnoxanthin) of Frangula bark. Cascarin crystallizes in orange-yellow needles; is odourless and tasteless, insoluble in water; soluble in chloroform, ether, alcohol and alkalies; with the latter it gives a purplish-red colour.

Uses, etc.—Tonic, purgative, etc. *Dose.*—10-60 grains in powder.

B.P. Preparations.

Extractum Cascaræ Sagradæ, alcoholic and aqueous; yield, 30 to 35 per cent.
Extractum Cascaræ Sagradæ Liquidum - - 1 in 1.

Preparations other than B.P.

Elixir and syrup (B.P.C.F.); tasteless liquid extracts made by removing bitterness with magnesia or lime are also prepared.

Note.—There are four species of Rhamnus growing in California, viz., R. ALNIFOLIA, R. CROCEA (*Californian mountain holly*), R. PURSHIANUS and R. CALIFORNICA (*Californian buckthorn*). The bark of the last-named much resembles that of the official species in appearance, and all the species have allied medicinal properties. The bark of R. WIGHTII is used in India.

RHAMNI FRANGULÆ CORTEX.—

Frangula Bark.—The dried bark of Rhamnus Frangula. Collected from the young trunk and moderate-sized branches, and kept at least one year before being used.

N.O.—Rhamnaceæ.

Syn.—Cortex Frangulæ; Alder Buckthorn Bark.

Habitat.—Holland.

Characters.—In small quills, the bark itself being about one twenty-fifth of an inch or somewhat more in thickness, and covered with greyish-brown or blackish-brown corky layer, marked with transverse whitish lenticels; inner surface smooth, brownish-yellow; fracture short and purplish externally, but somewhat fibrous and yellowish within. No marked odour; taste pleasant, sweetish, and slightly bitter.

Chemistry.—Frangulin, $C_{21}H_{20}O_9$ *(rhamnoxanthin)*, which is soluble in carbon bisulphide, alcohol and ether; there are also two resins, one soluble in ether and the other insoluble in that solvent, but soluble in alcohol; resinous matter; a little tannic acid; extractive; and *emodin*, which is also present in rhubarb root. Frangulin (trihydroxymethyl anthra-quinone) is a glucoside yielding on hydrolysis *emodin* ($C_{15}H_{10}O_5$) and *rhamnose* ($C_6H_{12}O_5$).

Uses, etc.—Tonic and laxative. *Dose.*—10-60 grains.

B.P. Preparations.

Extractum Rhamni Frangulæ - alcoholic and aqueous; yield, 30-35 per cent.
,, ,, ,, Liquidum, 1 in 1.

Note.—If the bark is used before the proper time it is said to produce sickness and diarrhœa. The fruit of this shrub is not unlike that of R. CATHARTICUS, but has only two or three roundish angular seeds. The leaves of this plant are entire ; the calyx, too, is five-parted, while the leaves of Rhamnus catharticus are serrate and the calyx four cleft.

CINNAMOMI CORTEX.—Cinnamon Bark.

The dried inner bark of shoots from the truncated stocks or stools of the cultivated cinnamon tree, Cinnamomum zeylanicum. Imported from Ceylon, and distinguished in commerce as Ceylon Cinnamon

N.O.—Laurineæ.

Habitat.—Ceylon.

Characters.—In closely rolled quills, each about three-eighths of an inch in diameter, and containing several smaller quills. It is thin, brittle, splintery, moderately pliable, dull, light, yellowish-brown externally, and marked by little scars or holes and faint, shining wavy lines, darker brown on its inner surface. Odour fragrant ; taste warm, sweet and aromatic. A decoction when cooled is not coloured by iodine.

Note.—The cinnamon trees are pollarded and treated in much the same way as our oak coppices are treated. The strips, from shoots one and a half to two years old, after removal, are allowed to undergo a species of fermentation for about twenty-four hours, and the outer and middle portions of the bark are removed and the liber dried, first in the shade, and afterwards in the sun. *Tellicherry cinnamon* liber bark is more fibrous and of an inferior flavour.

Chemistry.—Volatile oil, the essential constituent (one-sixth to 1 per cent.) ; sugar, mannite, starch, mucilage and tannic acid, with about 5 per cent. ash, consisting mainly of potassic and calcic carbonates. The starch is but feebly indicated by tincture of iodine, unless the latter be added in excess, the iodine being absorbed by the essential oil.

Uses, etc.—As stomachic, carminative and mild astringent. *Dose.*—10-20 grains in powder.

B.P. Preparations.

Aqua Cinnamomi - - - -	1 in 8.
Decoctum Hæmatoxyli - -	55 grains to 1 pint.
Infusum Catechu - - -	60 grains to 1 pint.
Oleum Cinnamomi.	
Pulvis Catechu Compositus -	1 in 10.
,, Cinnamomi Compositus	1 in 3.
,, Cretæ Aromaticus -	1 in 12.
,, Kino Compositus - -	1 in 5.
Tinctura Cardamomi Composita	1 in 40.
,, Catechu - - -	1 in 20.
,, Cinnamomi - - -	1 in 8 of rectified spirit.
,, Lavandulæ Composita	75 grains to 1 pint.
Vinum Opii - - - - -	75 grains to 1 pint.

OLEUM CINNAMOMI, B.P., the volatile oil distilled from the bark, is yellowish when recent, becoming cherry-red in colour on keeping ; has s. g. 1·023—1·043, aad is readily soluble in rectified spirit. The oil contains terpene, eugenol, and *cinnamic aldehyde* ($C_6H_5CHCHCOH$), the latter being the important constituent. When mixed with a saturated solution of potassium bisulphite a crystalline mass is produced. The long-keeping of the oil results in the oxidation of the cinnamic aldehyde, and the consequent formation of cinnamic acid which frequently crystallizes out. The freshly-distilled oil should be only slightly acid in alcoholic solution.

B.P. Preparation.—Spiritus Cinnamomi - - - 1 in 50.

Note.—Cinnamon leaf and cinnamon root oils are different from that obtained from the bark. The leaf oil consists almost entirely of eugenol with a small proportion of terpene and cinnamic aldehyde, while the oil obtained from the root contains eugenol with large quantities of terpene and safrol and a trace of benzaldehyde. The leaf oil is said to be much used to adulterate that of the bark.

NECTANDRÆ CORTEX.—Bebeeru Bark.

The dried bark of Nectandra Rodiæi.

N.O.—Laurineæ.

Syn.—Greenheart Bark.

Habitat.—British Guiana.

Characters.—In flattish, heavy pieces from one to two feet long, two to six inches broad, and a quarter of an inch or more thick. Externally greyish-brown, internally dark cinnamon-brown, and with evident longitudinal striæ. It is very hard and brittle, and its fractured surface presents a coarse-grained appearance. Inodorous, but with a strong bitter astringent taste.

Chemistry.—The amorphous alkaloids, *beberine* ($C_{18}H_{21}NO_3$) and *sipirine; beberic acid*, tannin, gum, resin, etc. Beberine is an amorphous alkaloid identical with *buxine* (from Buxus sempervirens) and *pelosine* (from Cissampelos Pareira). It is pale yellow, resinous in appearance, soluble in ether, and forms uncrystallizable salts with acids. Sipirine is also amorphous, but is insoluble in ether.

Uses, etc.—As tonic and antiperiodic. *Dose.*—30-60 grains; rarely given except in the form of alkaloid.

B.P. Preparation.

Beberinæ Sulphas. (Beberiæ Sulphas.)

Beberinæ Sulphas is described by the Pharmacopœia as a mixture of the sulphates of beberine, nectandrine and other alkaloids. The Pharmacopœia directs it to be prepared by exhausting the bark with sulphuric acid, precipitating the acid solution with alkali, dissolving the precipitated bases in sulphuric acid, evaporating the solution, painting on glass and drying. The compound thus obtained is in dark-brown, thin, translucent scales, yellow in powder, and having a bitter taste; it consists of about sixty per cent. of alkaloids, one half of which is beberine, the remainder being other amorphous alkaloids.

CASSIÆ CORTEX.—Cassia Bark.—The dried bark of Cinnamomum Cassia.

N.O.—Laurineæ.

Syn.—Chinese Cinnamon.

Habitat.—India and China.

Characters.—(1.) *Cassia Cinnamon.*—In quills of various length and about one-twenty-fifth of an inch or more in thickness; nearly deprived of the corky layer; yellowish-brown; outer surface somewhat rough; fracture nearly smooth; odour fragrant; taste sweet and warmly aromatic. (2.) *Saigon Cinnamon.*—In quills about six inches long and one-half to three-fifths of an inch in diameter; the bark about one-tenth of an inch thick; outer surface grey or light greyish-brown, with whitish patches, more or less rough from numerous warts and some transverse ridges and fine longitudinal wrinkles; the inner surface cinnamon-brown or dark-brown, granular and slightly striate; fracture short, granular in the outer layer, cinnamon-coloured, having near the cork numerous whitish striæ, forming an almost uninterrupted line; odour fragrant; taste sweet, warmly aromatic, somewhat astringent.

Chemistry.—Similar to Ceylon Cinnamon, but containing more starch and mucilage.

OLEUM CASSIÆ (*Chinese Cinnamon Oil*) is official in the U.S. and some other Pharmacopœias. It is heavier than the B. P. official oil, having s. g. 1·05 to 1·07 and it also differs from the latter in that it contains no eugenol, and, consequently, gives no green or blue colour with ferric chloride.

Note.—*Cassia lignea* is a term applied to several Cassia barks, amongst others to those of C. CASSIA, C. BURMANNI, C. TAMALA. The barks of C. INERS, C. OBTUSIFOLIUM, C. LOURIERI, C. CULILAWAN, C. SINTOK. C. INCERTA are also found in commerce.

Cassia vera in this country is the bark of C. BURMANNI and C. TAMALA. *Massoy bark* (the source of oil of Massoy) is obtained from MASSORA AROMATICA. *Cassia buds* consist of the calyx of the flower of one or more species of cinnamon. In appearance they somewhat resemble cloves.

COTO.—Coto Bark.—A dried bark of unknown origin.

N.O.—Laurineæ (probably).

Habitat.—Bolivia.

Characters.—Flat or curved, deprived of cork, one-fourth to one-half inch thick; outer surface cinnamon brown, smooth; inner surface darker brown; fracture granular and short in outer layer, fibrous and tough in the inner; odour aromatic, cinnamon-like; taste pungent, bitterish. An alcoholic dry extract is said to give a red coloration with nitric acid. Paracoto bark is very similar in appearance, though less pungent in odour and taste, and is not readily distinguishable from true Coto except by a comparison of their chemical constituents.

Chemistry.—*Cotoin*, $C_{22}H_{18}O_6$ (pale-yellow crystalline glucoside, soluble in alcohol, blood-red with nitric acid), *piperonylic* (*methylene proto-catechuic acid*), soft and hard resins, starch, gum, tannin, etc. Paracoto bark contains *paracotoin*, $C_{19}H_{12}O_6$, *leucotin*, hydrocotin, etc. Paracotoin gives a yellow (not red) colour with nitric acid.

Uses, etc.—Recommended in diarrhœa, etc. *Dose.*—5-10 grains in powder or tincture (B.P.C.F., 1 in 10 of rectified spirit). Cotoin and paracotoin are also given in doses of ¾ to 1½ and 1½ to 3 grains respectively.

CASCARILLÆ CORTEX.—Cascarilla Bark.—The dried bark of Croton Eluteria.

N.O.—Euphorbiaceæ.

Habitat.—Bahama Isles.

Characters.—In quills, from one to three or more inches in length, and from one-sixth to half an inch in diameter, covered with a dull-brown easily separable corky layer, which is more or less coated with a silvery or greyish-white lichen; fracture brown, short and resinous. It has a warm and nauseously bitter taste, and an agreeable aromatic odour, more especially when burned.

Chemistry.—Volatile oil $1\frac{1}{2}$ per cent. (consisting of a terpene and an oxygenated portion), resin, tannic acid, etc., and *cascarillin.* Cascarillin is a white, crystalline, inodorous bitter, soluble in alcohol, ether and hot water.

Uses, etc.—Aromatic and tonic. *Dose.*—15-30 grains.

B.P. Preparations.

Infusum Cascarillæ	1 in 10.
Tinctura Cascarillæ	1 in 8 of proof spirit.

Note.—Barks of other species of Croton are occasionally met with in commerce.

Malambo bark (CROTON MALAMBO, from Venezuela) is in quills one-half to one inch in diameter and six to eight inches long. It has a thin, soft, whitish, easily-removed cork; the inner surface is grey-brown, finely striate; fracture short, splintery; odour and taste aromatic and bitter. Composition similar to that of Cascarilla.

Copalchi bark (CROTON PSEUDOCHINA, from Mexico) is much like the preceding; it is about one-fifth of an inch thick, hard, dense, with a greyish or yellowish corky layer, and beneath this it is transversely fissured; bast is reddish-brown, coarsely striated, and breaks with a short, irregular fracture. Composition similar to that of Cascarilla.

A bark supposed to be that of CROTON LUCIDUS has been found occasionally mixed with Cascarilla bark. Its periderm does not peel off readily, and is of a fawn colour. Its inner surface is of a reddish tint, and is furnished with a number of straight, closely-packed, raised lines. The taste is not aromatic, but astringent, and almost without bitterness. Its tincture is not precipitated by water.

The species CROTON CASCARILLA grows in the Bahamas, and formerly yielded much of the Cascarilla bark of commerce.

MEZEREI CORTEX.—Mezereon Bark.—

The dried bark of Daphne Mezereum or of Daphne Laureola.

N.O.—Thymelaceæ.

Habitat.—Britain and Europe.

Characters.—In long thin, more or less flattened strips, which are commonly folded or rolled into disks; or in small quills of various lengths. Inner surface whitish, silky, very tough, and covered externally by an olive-brown or somewhat reddish-brown readily separable corky layer; no marked odour; taste burning and acrid.

Note.—The bark of the root is said to be more active than that of the stems. The stem bark has scars, and when fresh the green mesophlœum may be seen, which distinguishes it from root bark. The bark of the spurge lanrel has more of a grey tint than that of Mezereon. The flowers of Daphne Mezereum appear before the leaves, and are of a rose colour; those of Daphne Laureola are of a yellowish-green. The bark of the *spurge-flax* (D. gnidium) is very similar to the above, and has the same acrid properties.

Chemistry.—The important constituents are a soft acrid resin with vesicant properties and a glucoside *daphnin* which, by the action of dilute acids, is resolved into *daphnetin* (dioxycoumarin) and sugar.

Uses, etc.—Rarely given internally; externally stimulant and vesicant.

B.P. Preparations.

*Extractum Mezerei Æthereum; yield, $3\frac{1}{2}$ to 4 per cent.
Decoctum Sarsæ Compositum.

**Used in preparing* Linimentum Sinapis Compositum (8 grains in 1 fluid ounce).

Note.—An ointment prepared from an extract is official in several of the Continental Pharmacopœias. The U.S.P. has a fluid extract

QUERCUS CORTEX.—Oak Bark.—The dried bark of the smaller branches and young stems of Quercus Robur (Quercus pedunculata). Collected in spring, from trees growing in Britain.

N.O.—Cupuliferæ.

Habitat.—Britain.

Characters.—In quills covered with a smooth, shining, silvery or ash-grey, variegated with brown, corky layer; internally cinnamon-brown or brownish-red and longitudinally striated; fracture tough and fibrous; taste very astringent; no marked odour.

Chemistry.—*Quercitannic acid* (10-20 per cent.) is the important constituent. This body is said to be present in two forms, the one ($C_{28}H_{28}O_{14}$) soluble, the other ($C_{28}H_{24}O_{12}$) insoluble, in water. On heating gently they are converted into *oak-red* ($C_{28}H_{22}O_{11}$). Younger barks contain the largest amount of tannin. *Quercite* or oak sugar is also present.

Uses, etc.—As astringent.

B.P. Preparation.

Decoctum Quercûs - - - $1\frac{1}{4}$ ounce to 1 pint.

Allied species.—QUERCUS ALBA (white oak), official in the U.S., occurs in nearly flat pieces, deprived of the corky layer, about a quarter of an inch thick, pale brown; inner surface with short, sharp, longitudinal ridges; tough, of a coarse, fibrous fracture, a faint tan-like odour, and a strongly astringent taste. As met with in shops it is usually in an irregular coarse fibrous powder, which does not tinge the saliva yellow. In constitution this bark is similar to the English oak bark.

QUERCUS TINCTORIA (black oak).—The bark of this species is imported from America in large quantities under the name of *quercitron* and is used for dyeing. The colouring principle *quercitrin* $C_{36}H_{38}O_{20}$ (which in addition to querci-tannic acid it contains) is a glucoside resolvable into *quercetin* and a sugar.

QUERCUS ÆGILOPS.—The acorn cups of this tree are used, under the name of *valonia*, as a tanning material.

QUERCUS SUBER (cork oak).—The much developed epiphlœum or corky layer of the bark constitutes the cork of commerce; when taken from the young branches of the tree it is used by tanners under the name of European *alcornoque* bark. The inner bark of older stems is also imported for tanning purposes under the name of cork tree bark..

Other species of which the barks come into commerce are—Q. FALCATA (*Spanish oak*), Q. PRINUS (*white chestnut oak*) and Q. MONTANA (*rock chestnut oak*). Indian oak barks have been shown to contain tannins similar to those of the European species.

MYRICÆ CORTEX.—Bayberry Bark.—The bark of Myrica cerifera—the wax-myrtle.

N.O.—Myricaceæ.

Habitat.—N. America.

Characters.—In quills or curved pieces about one-sixteenth of an inch in thickness; externally whitish or greyish, scaly; beneath the corky layer smooth red-brown; inner surface red-brown, finely striate; fracture reddish, granular, slightly fibrous; odour somewhat aromatic, taste astringent, bitter, pungently acrid, *Chemistry.*—Volatile oil, a red colouring substance, tannic acid, resins, and a peculiar acrid principle having saponin-like qualities.

Uses, etc.—As tonic, astringent, in large doses emetic. *Dose.*—5-10 grains

LARICIS CORTEX.—Larch Bark.—The bark of Pinus Larix (Abies Larix). Collected in spring, deprived of its outer rough portion and dried.

N.O.—Coniferæ.

Habitat.—Britain.

Characters.—In flattish pieces or quills of varying lengths and sizes. The outer surface is dark-red or rosy, and somewhat uneven; inner surface nearly smooth, and yellowish-white or pinkish-red according to its age; fracture close, except the liber which is somewhat fibrous, and the fractured surface, except internally, of a deep carmine-red colour. Odour slightly balsamic and terebinthinous; taste astringent.

Chemistry.—Oleo-resin, gum, starch, sugar and *larixinic acid (larixine)*; the latter is a volatile, sublimable acid.

Uses, etc.—As astringent and gentle stimulant.

B.P. Preparation.

Tinctura Laricis - - - 1 in 8 of rectified spirit.

Note.—TEREBINTHINA VENETA (Venice or Larch Turpentine) is an oleo-resin obtained by boring to the heart-wood of the Larch tree, collecting and filtering. *Characters.*—It is a nearly transparent or slightly opaque and somewhat fluorescent, thick liquid, of a terebinthinate odour, a bitter and aromatic taste, and a yellowish or greenish-yellow colour. It is freely soluble in alcohol, amylic alcohol, acetone, and glacial acetic acid and does not become hard when mixed with magnesia. A fictitious variety is made by melting together oil of turpentine and resin.

HAMAMELIDIS CORTEX.—Hamamelis Bark.—The dried bark of Hamamelis Virginica, *Linn.*

N.O.—Hamamelaceæ.

Syn.—Witch Hazel.

Habitat.—Canada and United States.

Characters.—In quills or slightly curved pieces from two to six or eight inches long, and about one-tenth of an inch in thickness, covered with a silvery grey or whitish, easily detached scaly outer bark, marked with lenticels. Internally cinnamon-brown or brownish-red, and finely striated longitudinally; transverse fracture coarsely fibrous; tough; taste slightly astringent; no strongly marked odour.

Chemistry.—Tannin (8 to 10 per cent.) and a trace of volatile oil.

Uses, etc.—As tonic and astringent. *Dose.*—30-50 grains.

B.P. Preparation.

Tinctura Hamamelidis - - 1 in 10 of proof spirit.

Note.—An extract and a liquid extract are also prepared.

WINTERI CORTEX.—Winter's Bark.—The bark of Drymis Winteri.

N.O.—Magnoliaceæ.

Habitat.—Antarctic America.

Characters.—In small, thick, curved pieces, one-tenth to a quarter of an inch thick; dull yellowish-grey externally, reddish-brown and rough internally, with aromatic odour and warm pungent taste. A transverse section exhibits radiating white lines, which are the ends of the liber rays, diverging towards the circumferance in this manner. This feature distinguishes it from both Canella and Cinnamodendron barks. A decoction is darkened by a solution of ferric chloride.

Chemistry.—Volatile oil (containing *winterene* $C_{15}H_{24}$), tannin, resin, starch, etc.

Uses, etc.—Stimulant, aromatic tonic. *Dose.*—8-30 grains in powder or tincture.

Note.—Much of the so-called Winter's bark which has appeared in commerce from time to time has not been the bark of D. WINTERI. The barks of *Cinnamodendron corticosum* and of *Croton malambo* have been among the substitutions. The barks of several other species of Drymis, *e.g.*, D. CHILENSIS, D. AROMATICA, D. MEXICANA, D. GRANATENSIS, have similar properties to those of D. WINTERI.

MAGNOLIÆ CORTEX.—Magnolia Bark.—The bark of Magnolia glauca, M. acuminata, M. tripetala.

N.O.—Magnoliaceæ.

Syn.—Swamp Sassafras.

Habitat.—United States of America.

Characters.—The bark of the young wood is quilled or curved, thin, externally orange-brown, with warts or fissures; internally whitish and smooth; fracture short; inodorous; taste astringent, pungent, bitter. The bark from the old wood deprived of the cork is whitish, fibrous and less pungent.

Chemistry.—A crystalline principle, *magnolin*, has been found in the bark of some of the species. It is insoluble in water soluble in alcohol, ether, benzin, etc.

Uses, etc.—As a mild, stimulant, aromatic tonic and diaphoretic. *Dose.*—30-60 grains in decoction. Formerly official in the U.S.P.

Note.—The bark of the American *tulip-tree* (LIRIODENDRON TULIPIFERA) belongs to the same natural order as the above; contains a principle called *liriodendrin* or *tuliperine* The properties of the bark are similar to those of Magnolia bark.

ULMUS FULVA.—Slippery Elm.—The inner bark of Ulmus fulva.

N.O.—Ulmaceæ.

Syn.—Red Elm.

Habitat.—United States of America.

Characters.—In flat pieces varying in length and width, about one-eighth of an inch thick, tough, pale brownish-white, the inner surface finely ridged; fracture fibrous and mealy; the transverse section delicately checkered. Odour slight, peculiar (not unlike Fenugreek); taste mucilaginous, insipid. Powder greyish, fawn-coloured.

Chemistry.—Abounds in mucilage, which is precipitated by solutions of acetate and subacetate of lead, but not by alcohol; it is similar to the mucilage contained in linseed.

Uses, etc.—For demulcent poultices and to make a nutritious jelly.

ULMI CORTEX.—Elm Bark.—The dried inner (liber) bark of Ulmus campestris, Broad-leaved Elm, removed in spring from trees indigenous to and cultivated in Britain.

N.O.—Ulmaceæ.

Habitat—Britain.

Characters.—A tough brownish-yellow bark, about half a line thick, without smell; taste mucilaginous, slightly bitter and astringent. Its decoction is turned green by perchloride of iron, and precipitates with a solution of gelatine.

Chemistry.—Tannic acid (3 per cent.) gum and mucilage (20 per cent.), and a little resin.

Uses, etc.—As demulcent and emollient, formerly included in the B.P. for the production of a decoction. The U.S.P. has a mucilage 6 in 100.

SALIX.—Willow.—The bark of Salix alba and of other species of Salix.

N.O.—Salicineæ.

Habitat.—Britain, etc.

Characters.—In fragments or quills, from one-twenty-fifth to one-twelfth of an inch thick, smooth; outer surface somewhat glossy, brownish or yellowish, more or less finely warty, under the corky layer, green; inner surface brownish-white, smooth, the liber separating in thin layers; inodorous, bitter and astringent.

Chemistry.—Tannin, resin, fat, gum, etc., and *salicin* (see below).

Uses, etc.—As source of salicin.

SALICINUM B.P., SALICIN, $C_{13}H_{18}O_7$, is a crystalline glucoside obtained by treating the bark with hot water, removing tannin and colouring matter from the decoction, evaporating, purifying and crystallizing. It is obtainable in white, shining, slender crystals, inodorous, but very bitter, soluble in twenty-eight parts of cold water, in one of boiling water, soluble in alcohol, insoluble in ether and oil of turpentine. With concentrated sulphuric acid it gives a red colour, and when heated with potassium bichromate and sulphuric acid, the odour of oil of meadow-sweet is produced, due to the formation of salicylic aldehyde. By the action of dilute acids it is broken up into grape sugar and *saligenin* (ortho-oxybenzyl alcohol), which latter, by further boiling, yields *saliretin*. Nitric acid breaks it up into *helicin* and *helicoidin*.

Note.—The bark of SALIX NIGRA has been recommended as a medicine, and those o S. LUCIDA and the former contain more salicin than is found in the white willow. The barks of English-grown willows are said to be much poorer in salicin than those of the same species grown in America and on the Continent.

POPULUS.—Poplar.—The bark of Populus tremula (Aspen) and other species.

N.O.—Salicineæ.

Habitat.—Britain, etc.

Characters, Chemistry, etc.—The bark contains salicin, and in addition a substance named *populin*, $C_{20}H_{22}O_8$, which in appearance and properties much resembles salicin, and chemically consists of salicin and benzoic acid combined in the proportion of their equivalents, being benzoyl-salicin.

ALSTONIÆ CORTEX.—Dita Bark.—The bark of Alstonia (Echites) scholaris, the Devil Tree.

N.O.—Apocynaceæ.

Habitat.—Common in forests throughout India.

Characters.—It occurs in thick, irregular, more or less contorted pieces, easily broken. It consists of a rough greyish epidermis, investing a buff or pale cinnamon-coloured bark; internally still lighter in colour and of a spongy texture; having a very bitter taste, but devoid of odour.

Chemistry.—Three alkaloids are present, viz.:—*ditaine* (*echitamine*), *ditamine* and *echiterine*, and several fatty and resinous substances have also been named and described.

Uses, etc.—In intermittent fevers, as tonic, etc. Given in fluid extract.

Note.—Poelc bark, from A. SPECTABILIS (*Hab.* Java), contains the same alkaloids as the above, and in addition a crystalline alkaloid *asltonamine*.

ALSTONIA CONSTRICTA.—Bitter Bark.—The bark of Alstonia constricta.

N.O.—Apocynaceæ.

Habitat.—New S. Wales and Queensland.

Characters—In pieces from one and a quarter to two inches thick, deeply furrowed, externally brown-grey or after abrasion ochrey-yellow, and ridged upon the inner surface; the bast layer about one quarter of an inch broad, yellow, tough, fibrous and covered by the thick, spongy and friable corky layer which is composed of alternating bands of lighter and darker ochre colour; powder greyish-yellow; odour slight; taste persistently bitter.

Chemistry.—The alkaloids *alstonine (chlorogenine)*, *porphyrine*, *alstonidine*, with traces of others, are present.

Uses, etc.—As febrifuge, etc., said to have similar properties to Cinchona bark. Given in fluid extract.

Note.—Anderjoia or *Conessi Bark*, a false variety of which has been obtained from various species of Echites, is the bark of WRIGHTIA ANTIDYSENTERICA; it contains an alkaloid *wrightine* or *conessine*.

ASPIDOSPERMA.—Quebracho.—The bark of the tree Aspidosperma Quebracho (Quebracho blanco).

N.O.—Apocynaceæ.

Habitat.—Chili.

Characters.—Large pieces, half to three-quarters of an inch thick, covered on the outside with a very thick and rough corky layer, of a greyish-brown colour, and deeply divided by furrows and excavations. The inner bark is greyish or yellowish, smooth or somewhat fibrous, often with small black spots; taste intensely bitter, but without much odour.

Chemistry.—Six alkaloids have been described. viz.:—*Aspidospermine*, *aspidospermatine*, *aspidosamine*, *quebrachine*, *hypoquebrachine* and *quebrachamine*. Of these quebrachine is the most active.

Uses, etc.—Tonic, febrifuge and anti-asthmatic. *Dose.*—15-60 grains in tincture or fluid extract.

Note.—Quebracho Colorado:—the bark of this tree (LOXOPTERYGIUM LORENZII) contains twenty per cent. of tannin and two bitter alkaloids.

PRINOS.—Black Alder.—The bark of Prinos verticillatus (Ilex verticillata).

N.O.—Aquifoliaceæ.

Syn.—Winterberry; fever-bush.

Habitat.—United States of America.

Characters.—Thin, slender fragments, about one-twenty-fifth of an inch thick, fragile; outer surface brownish-ash coloured, with whitish patches and blackish dots and lines, the corky layer easily separating from the green tissue; inner surface pale-greenish or yellowish; fracture short, tangentially striate; nearly inodorous, bitter, slightly astringent.

Chemistry.—Contains tannic acid, but no berberine. The yellow colouring matter and bitter principle have not been isolated.

Uses, etc.—Astringent, tonic, ferbrifuge, etc. *Dose.*—30-60 grains in decoction.

Note.—The leaves of this plant mixed with those of VIBURNUM CASSINOIDES (*N.O.*—Caprifoliaceæ) constitute *Appalachian tea.*

VIBURNUM.—Black Haw.—The bark of Viburnum prunifolium.

N.O.—Caprifoliaceæ.

Habitat.—United States of America.

Characters.—In thin pieces or quills, glossy, purplish-brown, with scattered warts and minute black dots; when collected from old wood, greyish-brown; the thin corky layer, easily removed from the green layer; inner surface whitish, smooth; fracture short; inodorous, somewhat astringent and bitter.

Chemistry.—*Viburnin* (bitter principle), resins, valerianic acid, the common vegetable acids, including tannic acid, salts of calcium and potassium.

Uses, etc.—Diuretic, tonic, etc. *Dose.*—30-60 grains. Included in the U.S.P. for the production of a fluid extract.

Note.—The bark of V. OPULUS occurs in flattish or curved bands, or occasionally in quills; outer surface ash-grey, marked with scattered, somewhat transversely elongated warts of a brownish colour, and more or less marked with blackish dots and longitudinal, black, irregular lines on their ridges; inner surface dingy-white or brownish; fracture tough, tissue separating in layers; inodorous, taste somewhat astringent and bitter. *Chemistry, uses, etc.*, probably similar to those of V. PRUNIFOLIUM.

CONDURANGO CORTEX.—Condurango Bark.—The sun-dried bark of Gonolobus Condurango.

N.O.—Asclepiadaceæ.

Syn.—Condurango blanco.

Habitat.—South America (New Granada.)

Chemistry.—Tannin, extractive matter, resins and *condurangin*. Condurangin, formerly described as a glucoside, is now said to consist of two principles, both decomposed by water.

Uses, etc.—Introduced as a specific for cancer. *Dose.*—10-30 grains in fluid extract, infusion or tincture.

Note.—*Guaquil* and *Mexican Condurangos* are derived from species not described.

CALOTROPIS CORTEX.—Mudar Bark.—The dried root-bark of Calotropis gigantea (Calotropis Madarii Indico-orientalis).

N.O.—Asclepiadaceæ.

Habitat.—Lower Bengal, Madras and Malayan Peninsulas and Ceylon.

Characters.—It occurs in small, flat or arched pieces, brownish externally, of a yellow-greyish colour internally, with a peculiar smell, and a mucilaginous, nauseous, acrid taste.

Chemistry.—An acrid resin, a crystalline, colourless substance, *madaralban*, *madarfluavil* and *caoutchouc.*

Uses, etc.—Recommended in leprosy; used in rheumatism, etc; "an excellent substitute for ipecac. in dysentery." *Dose.*—5-10 grains in powder

CORNUS.—Dogwood.—The bark of the root of Cornus florida.

N.O.—Cornaceæ.

Habitat.—Canada and United States of America.

Characters.—In curved pieces of various sizes about one-eighth of an inch thick; deprived of the furrowed brown-grey corky layer; outer and inner surface pale reddish, or light reddish-brown, striate; transverse and longitudinal fracture short; whitish, with brown, yellow striæ; inodorous; astringent and bitter.

Chemistry.—*Cornin* (a neutral crystalline principle), bitter extractive, resin, tannic and gallic acids (3 per cent.) and salts.

Uses, etc.—As tonic and astringent; introduced as a remedy in intermittent fevers.

Note.—The *round-leaved dogwood* (CORNUS CIRCINATA) and the *swamp dogwood* (C SERICEA) have barks with similar properties to the above.

JUGLANS.—Juglans.—The bark of the root of Juglans cinerea.

N.O.—Juglandaceæ.

Syn.—Butternut.

Characters.—In flat or curved pieces about one-fifth of an inch thick; the outer surface dark-grey and nearly smooth, or deprived of the soft cork and dark-brown; the inner surface smooth and striate; transverse fracture short, delicately checkered, whitish and brown; odour feeble; taste bitter and somewhat acrid.

Chemistry.—*Nucin* (*juglandic acid, juglone*), which is acid, orange-yellow crystalline, purple with alkalies, volatile; fixed oil and tannin.

Uses, etc.—As cathartic and tonic. *Dose.*—60-120 grains. Official in the U.S. for the production of an extract.

Note.—The kernel of the fruit of the butternut contains much fixed oil, as also does the *English walnut* (JUGLANS REGIA).

AZADIRACHTÆ CORTEX.—Nim Bark.—The bark of Azadirachta Indica.

N.O.—Meliaceæ.

Syn.—Margosa bark.

Habitat.—India.

Characters.—Varying in appearance according to the size and age of the tree producing it. The bark from the trunk of a tree above three or four years of age is covered with a thick, scaly epidermis, and varies in thickness from one-fourth to one-half an inch. That from the smaller branches is smooth, of a dullish purple colour, marked by longitudinal lines of ash-coloured epidermis, from one-eighth to one-twelfth of an inch apart. Inner layer of bark of a whitish colour in the fresh state, powerfully bitter, but less astringent than the outer dark-coloured layer.

Chemistry.—*Margosin* (a crystallizable principle) and *catechin* (an astringent).

Uses, etc.—Official in India. *Dose.*—60 grains, given in powder, decoction and tincture. Has astringent, tonic and antiperiodic properties.

Note.—MELIA AZEDARACH.—The bark of the root of this small American tree, cultivated in many parts of India, is used in America as an anthelemintic and emetic. It was formerly included in the U.S.P.

SOYMIDÆ CORTEX.—Rohun Bark.—The bark of Soymida febrifuga.

N.O.—Cedrelaceæ.

Habitat.—India (Malabar, etc.)

Characters.—Occurs in compact, thick, fibrous pieces, of a rusty-grey or brown colour and bitter, astringent taste. The inner side and edges are usually of a bright, reddish-brown colour.

Chemistry.—Tannic and gallic acids and a bitter amorphous principle.

Uses, etc.—As astringent, tonic and antiperiodic. *Dose.*—60 grains in dysentery, etc.

GOSSYPII RADICIS CORTEX.—Cotton Root Bark.

The bark of the root of Gossypium herbaceum and of other species of Gossypium.

N.O.—Malvaceæ.

Habitat.—Asia and Africa.

Characters.—In thin flexible bands or quilled pieces; outer surface brownish-yellow, with slight longitudinal ridges or meshes, small black, circular dots or short transverse lines and dull, brownish-orange patches from the abrasion of the thin cork; inner surface whitish, of a silky lustre, finely striate; bast fibres long, tough and separable into papery layers; inodorous; taste slightly acrid and faintly astringent.

Chemistry.—The bark contains a peculiar colourless, acid resin, soluble in water, becoming insoluble and red in colour when oxidised.

Uses, etc.—Said to have properties similar to those of ergot. Official in the U.S. for the production of a fluid extract. *Dose.*—30-60 grains.

ERYTHROPHLŒUM.—Sassy Bark.—The dried bark of Erythrophlœum guineense.

N.O.—Leguminosæ.

Syn.—Mancona bark.

Habitat.—West and Central Africa.

Characters.—Flat or curved, about one-quarter of an inch thick; externally warty, fissured, red-brown, hard; fracture coarsely granular and fibrous; inodorous, astringent, bitter and acrid.

Chemistry.—The alkaloid *eryrthrophleine*, tannin, gallic acids, resin, gum, red colouring matter, etc.

Uses, etc.—Introduced as a heart tonic; has also astringent and analgesic properties. The B.P.C.F. has a tincture (1 in 10 of rectified spirit) and the hydrochlorate of the alkaloid has also been used.

PISCIDIA.—Jamaica Dogwood.—The bark of Piscidia Erythrina.

N.O.—Leguminosæ.

Habitat.—West Indies.

Characters.—In pieces of two to four inches in length and from one to two inches wide and about one-eighth of an inch in thickness. The outer surface of some of the pieces is of a dark grey-brown colour, others of a yellow-brown. The bark is frequently studded with flattened protuberances of a lighter colour than the surrounding cork. The central part of the bark is much lighter coloured, and when wet or freshly-broken is of a peculiar blue-green colour. The inner part of the bark is of a dark-brown colour and very fibrous. It has a strong, disagreeable opium-like odour when broken. It is acrimonious and produces a burning sensation in the mouth and pharynx.

Chemistry.—*Piscidin* (neutral, colourless, crystalline, insoluble in water), resin, fat, etc.

Uses, etc.—As sudorific and narcotic. *Dose.*—15-45 grains in fluid extract, etc. Has been employed in catching fish on account of its stupefying properties.

HIPPOCASTANI CORTEX.—Horse-chestnut Bark. The bark of Æsculus Hippocastanum.

N.O.—Sapindaceæ.

Habitat.—Persia and India ; cultivated in Europe.

Characters.—Thin, externally brown-grey, with small scattered warts showing opposite leaf-scars, which bear on their lower rounded margin five or seven small warts. Inner surface smooth and whitish, internal colour brownish ; inner bark tough, breaking with a fibrous fracture ; odour slight ; taste bitter and astringent.

Chemistry.—*Æsculin*, $C_{15}H_{16}O_9$ and *fraxin* (*paviin*), $C_{16}H_{18}O_{10}$. Æsculin is white, crystalline, soluble in water, showing a blue fluorescence, increased by the presence of an alkali : it is a glucoside yielding æsculetin (a dioxy-coumarin) and sugar as hydrolytic products.

Note.—The cotyledons of the seed contain 2-4 per cent. of a bland fixed oil, *oleum hippocastani*.

10.—MISCELLANEOUS DRUGS.

Under this head are included hair-structures and those parts of plants such as arils, etc., which are regarded as being more or less abnormal.

LUPULINUM.—Lupulin.—A glandular powder obtained from the dried strobiles of Humulus Lupulus.

N.O.—Urticaceæ.

Syn.—Lupulinic Glands.

Habitat.—England.

Characters.—A granular bright brownish-yellow powder, which, under the microscope, is seen to consist of minute, somewhat globular, top-shaped, reticulated, translucent, shining glands. It burns readily, and has the agreeable aromatic odour and taste of hop. On incineration it should not yield more than about 15 per cent. of ash. Not more than about 30 or 40 per cent. should be insoluble in ether.

Chemistry.—See under Lupulus.

Uses, etc.—Aromatic, tonic, sedative, etc. *Dose.*—2-5 grains. Included in the U.S.P. for the production of a fluid extract and oleo-resin.

GALLA.—Galls.—Excrescences on Quercus lusitanica *var.* infectoria (Quercus infectoria), caused by the puncture and deposit of an egg or eggs of Cynips Gallæ-tinctoriæ.

N.O.—Cupuliferæ.

Syn.—Nut-galls.

Habitat.—Smyrna, East Indies, etc.

Characters.—Hard, heavy, subglobular, from half an inch to three-quarters of an inch or more in diameter, tuberculated on the surface, the tubercles and intervening spaces being smooth; dark bluish-green or dark-olive green externally, yellowish or brownish-white within, with a small central cavity. No odour; taste intensely astringent, followed by some degree of sweetness.

Note.—The females of this species of hymenopterous insect pierce the tender branches of this small stunted oak with their ovipositor and deposit one or more eggs. The irritation thus produced causes a flow of the juices of the plant and subsequent formation of a gall around the larva.

VARIETIES.—(*a.*) *Blue galls* (Gallæ Cæruleæ), vary in size and are gathered before the insect has left its prison.

(*b.*) *Green galls:* the same, but greenish, and often larger than the blue.

(*c.*) *White galls* are of a light colour, and generally have a small round hole in them through which the insect has made its escape. They are inferior in astringent property and not official.

(*d.*) *Mecca galls* (from Bussorah), known as Dead Sea apples, and "mala nisana," are spherical in shape and surrounded about the centre by a circle of horned protuberances. Not official.

(*e.*) *English galls:* spherical, brown, smooth, no protuberances, light in weight, and usually with perforation showing the release of insect.

(*f*) *Chinese galls:* of an irregular shape and very astringent taste. Imported from China, and said to be formed by the puncture of the leaves of Rhus semialata (Coniferæ) by a species of aphis.

Chemistry.—Gallo-tannic acid (30 to 60 per cent.), *gallic acid* (2 to 4 per cent.), sugar and gum (2·4 per cent.), resin, albuminous matter, a little starch, calcium salts (2·4 per cent.) and insoluble matter, chiefly lignin.

Uses, etc.—As powerful astringent. *Dose* (in powder).—10-20 grains.

B.P. Preparations.

Acidum Gallicum.	
,, Tannicum.	
Tinctura Gallæ - - -	1 in 8 of proof spirit.
Unguentum Gallæ - -	80 grains to 1 ounce.
,, ,, cum Opio	80 grains to 1 ounce, nearly.

TANNIC ACID (Gallo-tannic acid), $C_{27}H_{22}O_{17}$, is extracted from galls by treatment with a mixture of ether and water, and is obtained in thin, glistening scales or yellow vesicular masses, readily soluble in water and in rectified spirit.

B.P. Preparations.

Glycerinum Acidi Tannici - - -	1 in 4½ (by vol.)
Suppositoria Acidi Tannici - - -	each containing 3 grains.
,, ,, cum sapone	,, ,, ,,
Trochisci Acidi Tannici - - - -	,, ,, ½ grain.

Note.—There are in the vegetable kingdom many substances resembling tannin, some of which give a green precipitate with ferric chloride, *e.g.*, cinchona-tannic acid, catechu-tannic acid, caffetanic acid, etc.

GALLIC ACID, $C_7H_6O_5,H_2O$, is obtained from galls by treatment with diluted sulphuric acid; the acid has the effect of hydrating the tannic acid. It occurs in acicular prisms or silky needles, readily soluble in boiling water, in rectified spirit and in glycerine; soluble in 100 parts of cold water. It may be distinguished from tannic acid by not giving a precipitate with gelatine.

B.P. Preparation.

Glycerinum Acidi Gallici - - - - -	1 in 4½ (by volume).

KAMALA.—Kamala.—A powder which consists of the minute glands and hairs obtained from the surface of the fruits of Mallotus philippinensis (Rottlera tinctoria).

N.O.—Euphorbiaceæ.

Habitat.—India.

Characters.—A fine granular mobile powder of a brick-red or madder-colour, and nearly tasteless and inodorous. Water has scarcely any effect on it, even at a boiling temperature, but it forms deep red solutions with alcohol, ether, or chloroform. When examined by the microscope it is seen to consist of irregular spherical flattened or depressed garnet-red glands with wavy surfaces, mixed with nearly colourless thick-walled stellate-hairs. On ignition in air it should yield four or five, or at most ten, per cent. of ash. The lighter coloured particles present in Kamala are bits of the epicarp, and may be separated from the glands by taking advantage of their lightness, either by a process of winnowing or rolling down an inclined piece of paper. When blown across a flame it ignites with a flash like lycopodium.

Chemistry.—Resin (80 per cent.), *rottlerin* (crystalline, soluble in ether, insoluble in water), tannic acid, gum and volatile oil. The ash is limited by the B.P., but many commercial samples yield very much more, as much as 60 per cent. having been noted, the excessive percentage being due to sand and a ferruginous earth. The resin is said to be the active constituent.

Uses, etc.—As tænicide with purgative action. *Dose.*—30-120 grains. A non-official tincture is prepared.

Note.—*Wurrus*, *Vars* or *Wars* is a kamala imported from Aden; the glands, when viewed with the microscope, are seen to be different from the official powder. It is said to be derived from HEMINGIA GRAHAMIANA. ROTTLERA SCHMIPERI yields a bark (*Cortex Musenæ*) which has anthelmintic properties.

GOSSYPIUM.—Cotton Wool.—The hairy parenchymatous covering of the seeds of Gossypium barbadense and of other species of Gossypium, from which fatty matter and all foreign impurities have been removed.

N.O.—Malvaceæ.

Syn.—Cotton.

Habitat.—America, India, etc.

Characters.—In white, soft filaments, each consisting of an elongated tubular cell, and when examined under the microscope appearing as a flattened twisted band, with slightly thickened rounded edges; inodorous and tasteless. It should readily be wetted by water, to which it should not communicate either an alkaline or acid reaction. On ignition in air it burns, leaving less than one per cent. of ash.

Note.—The above description applies to purified or, as it is commonly called, "absorbent" cotton-wool.

Chemistry.—Ordinary cotton-wool ("non-absorbent") contains about 10 per cent. of fixed oil. Pure cotton consists essentially of nearly pure cellulose ($C_6H_{10}O_5$) and yields with nitric acid the explosive compounds known under the name of nitro-cellulins. Dinitrocellulin, the official pyroxylin or gun-cotton, is used in the preparation of collodion, and is readily soluble in three parts of ether mixed with one part of rectified spirit.

Note.—Cotton seeds by expression yield a fixed oil (12 to 20 per cent.) of a dark brown colour, which, by bleaching, becomes changed to a pale straw colour. Its s. g. is about 0·920 to 0·921. and congelation point 2° C. It possesses a bland nut-like taste after purification and is classed under the "drying oils."

Uses, etc.—For preparing collodion and for surgical dressings.

B.P. Preparations.
Pyroxylin, *from which are prepared*
*Collodium.
,, Vesicans.
**Used in preparing* Collodium Flexile.

Note.—Pyroxylin is di-nitrocellulose, $C_6H_8(NO_2)_2O_5$, and is prepared by the action of a mixture of nitric and sulphuric acids on cotton. Gun-cotton (trinitrocellulin), $C_6H_7(NO_2)_3O_5$, unlike the above, is insoluble in alcohol and ether.

MUCUNA.—Cowhage.—The hairs of the legumes of Mucuna (Dolichos) pruriens.

N.O.—Leguminosæ.

Habitat.—E. and W. Indies.

Characters.—One-celled, one-twelfth to one-eighth of an inch long, stiff, brown-red, sharply serrate and pointed, thick-walled, partly filled with a brown granular matter. When handled they are intensely irritating to the skin.

Chemistry.—Tannin and resin.

Uses, etc.—As mechanical anthelmintic. *Dose.*—1-3 grains mixed with treacle.

SASSAFRAS MEDULLA.—Sassafras Pith.—The pith of Sassafras officinale.

N.O.—Laurineæ.

Habitat.—Indigenous to North America.

Characters.—In slender cylindrical pieces, often curved or coiled, light, spongy, white, inodorous, insipid. Macerated in water it forms a mucilaginous liquid which is not precipitated by the addition of alcohol.

Chemistry.—Its principle constituent is mucilage, not precipitated by by alcohol or lead acetate.

Uses, etc.—As demulcent, etc. Included in the U.S.P. for the production of a mucilage.

MACIS.—Mace.—The arillus of the fruit of Myristica fragrans (Nutmeg).

N.O.—Myristaceæ.

Habitat.—Banda Isles.

Characters.—In narrow bands one inch or more long, somewhat branched and lobed above, united to broader bands below; brownish-orange; fatty when scratched or pressed; odour fragrant, taste warm and aromatic. Mace is situated on the hard testa of the seed and is developed from the hilum. After removal it is dried in the sun, or in wet weather by artificial heat.

Chemistry.—Volatile oil, which exudes readily on pressure (7 to 9 per cent.); a thick aromatic balsam, consisting of a resin, and semi-resinified essential oil (corresponding to the fixed oil of nutmeg) 25·5 per cent.; uncrystallizable sugar (1·4 per cent.); mucilage (1·8 per cent.); the remainder being albumin. It contains no starch and no fat.—*Flückiger.*

Uses, etc.—As stimulant, tonic; its chief use, however, is as a flavouring agent.

ARAROBA.—Goa Powder.—The medullary matter of the stem and branches of Andira araroba, dried and powdered; containing more or less chrysophanic acid according to age and condition, yielding much chrysophanic acid by oxidation.—B.P.

N.O.—Leguminosæ.

Habitat.—Brazil, etc.

Characters—Light yellow when fresh, becoming darker on keeping; somewhat crystalline, rough, mixed with wood fibres; inodorous, bitter, strongly irritating the air passages.

Note.—Much confusion has been caused by the B.P. (1885) treating Goa Powder and Chrysarobin as synonymous.

Chemistry.—*Chrysarobinum* (80 to 84 per cent.), resin (2 per cent.), woody fibre (5·5 per cent.), bitter extractive (7 per cent.)

CHRYSAROBINUM B.P. (Chrysarobin) is extracted from Goa powder by means of solvents. As purified by solvents (benzol, etc.) it is a light brownish-yellow, minutely crystalline powder, tasteless and inodorous. Very sparingly soluble in water, but almost entirely soluble in 150 parts of hot rectified spirit. On heating it melts and partially sublimes in yellow vapours, leaving a charred residue which entirely disappears on ignition in air. It dissolves in sulphuric acid to form a yellow to orange-red solution, and in solution of caustic potash to form a yellow to reddish fluorescent solution which becomes of a carmine-like colour by absorption of oxygen from the air. By oxidizing agents it is readily converted into chrysophanic acid.

Uses, etc.—As irritant externally in skin diseases, and given internally in doses of from $\frac{1}{6}$ to $\frac{1}{2}$ grain.

B.P. Preparation.

Unguentum Chrysarobini - - 1 of Chrysarobin in 25.

Note.—Chrysarobin is still not uncommonly called chrysophanic acid, for under this name it was first known.

B. CRYPTOGAMOUS.

These consist of organised vegetable drugs derived from, or themselves being, plants devoid of flowers, including ferns, algæ, fungi, etc.

FILIX MAS.—Male Fern.—The rhizome with the persistent bases of the petioles of Aspidium Filix-mas. Collected late in the autumn, divested of its scales, roots, and all dead portions, and carefully dried with a gentle heat. Should not be used if more than a year old.

N.O.—Filices.

Syn.—Lastræa Filix Max, Nephrodium Filix Mas, Polypodium Filix Mas, Aspidium.

Habitat.—Indigenous.

Characters.—From three to six inches or more in length, and the rhizome itself from three-quarters of an inch to an inch in diameter, but, being entirely covered by the hard, persistent, curved, angular dark brown bases of the petioles, is apparently two or more inches; brown externally, yellowish-white or brownish internally. Odour feeble but disagreeable; taste sweetish and astringent at first, but subsequently bitter and nauseous. The official rhizomes are distinguished from those of closely allied plants by the section of the leaf base showing eight to ten vascular bundles in a loose circle. The microscopic character of the tissue of ferns is characterised by having numerous scalariform vessels.

Chemistry.—A green fixed oil (6·9 per cent.), a little volatile oil, resin (4·1 per cent.), *filitannic acid* (10 per cent.), starch, gum and crystallisable sugar. The ash amounts to from 2 to 3 per cent. Male fern rhizomes yield to ether about 8 per cent. of an extract which gradually deposits a crystalline substance called *filicic acid*, which is said to be dibutyryl phloroglucin.

Uses, etc.—As tænifuge.

B.P. Preparation.

Exractum Filicis Liquidum, made with ether; also known as Oil of Malefern.

Note.—The U.S.P. includes, beside the above, the rhizome of ASPIDIUM MARGINALE, which in cross section shows only about six vascular bundles. *Inkomankomo* is the name given in S. Africa to the rhizome of A. ATHAMANTICUM which in Europe receives the name of *pannum*.

ERGOTA.—Ergot.—The sclerotium of Claviceps purpurea, produced between the pales, and replacing the grain Secale cereale.

N.O.—Fungi, Ascomycetes.

Syn.—Secale cornutum, Secale clavatum, Spurred rye.

Habitat.—Indigenous and Europe.

Characters.—Subcylindrical or obscurely triangular, tapering towards the ends, generally arched or curved; from one-third of an inch to an inch and a half in length; longitudinally furrowed on each side, but more especially on that which is concave, and often irregularly cracked; violet-purple externally, whitish or pinkish-white within; fracture short. Odour peculiar and disagreeable, more especially if the powder be triturated with solution of potash; taste mawkish and rancid.

Note.—There are three stages in the life-history of this fungus:—1st. The loose *sphacelium* originating in the young ovary of the rye. 2nd. The *sclerotium* produced within the meshes of the sphacelium (this is the ergot). 3rd. The *sporocarp* produced as offshoots of the sclerotium and consisting of radially-arranged spore-cases (*perithecia*), each of which contains numerous spores (*asci*). This fungus is not peculiar to rye, but occasionally infests all grasses.

Chemistry.—Ergot contains many constituents, and published analyses are so far much at variance. The most recent pronouncement (Kobert) is that there are three physiologically active bodies, viz., *ergotic acid* (probably identical with *sclerotic acid* of Dragendorff), *sphacelic* acid and the alkaloid *cornutine (ecboline).* The latter is said to be highly poisonous and both it and sphacelic acid entirely lose their activity on keeping.

There are also present, a fixed oil *(oil of ergot)*, obtainable by treating the drug with ether or benzine; a crystallized, colourless alkaloid, Tanret's *ergotinine (ergotine* of Wenzell); and the following amorphous principles have been described by Dragendorff:—*Scleromucin* (a mucilage), *sclererythrin* (a red colouring matter), *scleroiodin* (a bluish-black substance) *fusco-sclerotinic acid*, *picro-sclerotine* (a poisonous alkaloid); *scleroxanthin* and *sclerocrystallin* are crystalline.

Note.—Ergot deteriorates, and if not well dried and kept in stoppered bottles is liable to be attacked by minute insects (species of Acari). The stock should be renewed annually. The addition of a few drops of chloroform assists in its preservation. The removal of the oil by means of benzin or ether, or by expression, has also been suggested for the same purpose, but without general approval.

Detection of Ergot in Flour and Bread.—Macerate in ether, acidulated with diluted sulphuric acid for twenty-four hours; shake up the ethereal solution with a concentrated solution of sodium carbonate: the latter acquires a reddish-violet colour, due to sclererythrin, if ergot be present.

Uses, etc.—For contraction of uterus, etc. *Dose.*—10-30 grains.

B.P. Preparations.

Extractum Ergotæ Liquidum	1 in 1.
Infusum Ergotæ - - - -	1 in 40.
Tinctura Ergotæ - - - -	1 in 4 of proof spirit.
Ergotinum, *from which is prepared*	
Injectio Ergotini Hypodermica	10 in 27.

Note.—Preparations other than B.P.—Ammoniated tincture (B.P.C.), sclerotic acid ergotinine.

SUBSTITUTIONS OF ERGOT.—The ergot from other graminaceous plants:—*Ergot of wheat*, which is shorter and thicker than the official kind; *ergot of oat* is much more slender; *ergot of diss* (the ergot of ARUNDO AMPELODESMOS, a North African grass), which is said to be twice as active as that of rye.

CETRARIA.—Iceland Moss.—The dried lichen, Cetraria islandica.

N.O.—Lichenes (Ascomycetous Fungi).

Syn.—Iceland lichen.

Habitat.—North Europe, etc.

Characters.—Foliaceous, much branched in an irregular dichotomous manner into fringed obtuse or truncate flattened lobes; crisp, smooth and usually brownish or greyish-white above, whitish beneath, and marked irregularly with small white depressed spots. Almost odourless when dry, but when moistened with water having a feeble seaweed-like odour; taste mucilaginous and slightly bitter. A strong decoction gelatinises on cooling.

Chemistry.—*Lichen-starch* ($C_{12}H_{20}O_{10}$) and *cetrarin;* lichen-starch is present to the extent of about 40 per cent. and consists of a mixture of *lichenin* and *lichenoid;* the former is insoluble in cold water and is but slightly coloured by iodine, the latter is somewhat soluble in cold water and is coloured deep blue by iodine. Cetrarin, the bitter principle, is soluble in alcohol and in alkalies; it consists of *cetraric acid* ($C_{30}H_{30}O_{12}$), *lichen-stearic acid* and a green colouring substance, *thallochlor.*

Uses, etc.—As demulcent and tonic, etc.

B.P. Preparation.

Decoctum Cetrariæ - - - - - 1 in 20.

Note.—Iceland moss, deprived of some of its bitter principle by continued macceration in water, has been, and probably is still, used as an article of diet. The powder (freed from bitter principle) is a useful demulcent and emulsifying agent.

CEREVISIÆ FERMENTUM.—Beer Yeast.—The ferment obtained in brewing beer, and produced by Saccharomyces (Torula) cerevisiæ.

N.O.—Fungi, Saccharomycetes.

Characters.—Viscid, semifluid, frothy, exhibiting under the microscope numerous isolated roundish or oval cells, or short branched filaments composed of united cells; odour peculiar, taste bitter.

Chemistry.—Payen found dry yeast to consist of albuminoids (62·73 per cent.), cellulose (29·37 per cent.), fat (2·10 per cent.) and ash (5·8 per cent.) The ash consists almost entirely of phosphate of potassium. By the action of good yeast on a solution of 100 parts of saccharose (cane sugar) in a suitable quantity of water, and, under favourable circumstances, 105·36 parts of glucose are obtained, which split up into 51 parts of alcohol, 48·5 parts of carbonic anhydride, 3·16 parts of glycerine, 0·67 part succinic acid and 1 part of cellulose, etc.

Uses, etc.—Antiseptic and stimulant; in poultice for ulcers, etc. *Dose.*—$\frac{1}{2}$-1 ounce.

B.P. Preparation.—Cataplasma Fermenti.

LYCOPODIUM.—Lycopodium.—The sporules of Lycopodium clavatum (the Common Club Moss) and of other species of Lycopodium.

N.O.—Lycopodiaceæ.

Syn.—Vegetable sulphur.

Habitat.—Central Europe.

Characters.—A fine, pale-yellowish, very mobile, inodorous and tasteless powder, floating upon water and not wetted by it, and burning quickly when thrown into a flame. Under the microscope the granules are seen to be four-sided, reticulated, and to have short projections on the edges. Lycopodium should be free from pollen, starch, sand and other impurities, many of which are easily detected by the microscope.

Chemistry.—Fixed oil (47 per cent.), ash (4 per cent.) Sugar is also said to be present to the extent of 3 per cent.

Uses, etc.—Has been prescribed in the form of tincture; its chief pharmaceutical use is as a pill-powder.

LACMUS.—Litmus.—A blue pigment obtained from Lecanora tartarea; Rocella tinctoria; Rocella fusiformis, and from other lichens, as Variolaria and Parmelia.

N.O.—Lichens.

Habitat.—The maritime rocks of Madeira, the Azores, Canary and Cape de Verde Islands.

Characters.—It is in earthy, friable cakes or cubes, of a deep blue or purplish-blue colour, and a slight saline and somewhat pungent taste. It effervesces with acids and is partly soluble in water with a blue colour, and in dilute alcohol with a purplish-blue colour, which is changed to red by acids. It contains much gypsum and chalk. Litmus is prepared chiefly, it is said, in Holland by grinding the weed with pearlashes, and repeatedly moistening the mixture with ammonia water or urine. The mass passes in colour from brownish-red to purple, and finally blue; it is then mixed with chalk and gypsum and moulded.

Chemistry.—The lichens yielding litmus, orchil and cudbear contain certain acids or acid anhydrides variously known as *lecanoric*, *orcellic*. *erythric*, etc., acids. These principles under the action of ammonia and the atmosphere yield *orcein*, the alkali salts of which are purple (orchil). By the use of potassium or sodium in addition, a different colouring matter (*azolitmin*), the alkali salts of which are blue (litmus), is obtained. In addition to azolitmin, litmus contains other colouring matters, viz., *erythro-litmin*, *erythrolein* and *spaniolitmin*; but since spaniolitmin is rarely present, and ethrythrolein gives reddish-purple with alkalies, the two remaining principles of the four must be considered to be the essential colouring matters.

Uses, etc.—Litmus is largely used as an indicator in testing fluids for alkalinity or acidity : the free colouring matter is red, while in combination with alkalies it is blue. For this purpose it is used in the form of an aqueous solution or in that of paper prepared from the latter.

Note.—Orchil (*archil*) is prepared as a thickish liquid in the same way as litmus, but without the addition of pearlashes and the final admixture with chalk and gypsum ; it is used as a dye. *Cudbear* is a purplish-red powder, prepared by evaporating on ammoniacal infusion of the lichens to dryness, and afterwards reducing to powder ; it is used as a dye.

CHONDRUS.—Irish Moss.—The entire plant of Chondrus crispus and Chondrus mammilosus.

N.O.—Algæ, Florideæ.

Syn.—Fucus crispus ; Carrageen.

Habitat.—Found growing on the rocks of the European and American shores of the Atlantic.

Characters.—Yellowish or white, horny, translucent, many-forked ; when softened in water, cartilaginous ; segments flat, wedge-shaped or linear, at the apex emarginate or two-lobed ; it has a slight seaweed-like odour and a mucilaginous, somewhat saline, taste. One part of it boiled for ten minutes with thirty parts of water yields a solution which gelatinizes on cooling.

Note.—The sporocarps of Chondrus mammilosus are somewhat stalked. Irish moss is collected in spring-time on the coasts of Ireland and New England. It is a marine alga and not a moss.

Chemistry.—Mucilage (90 per cent.), 9·5 per cent. of which is soluble in cold water ; ash (8 to 15 per cent.) There is also present ½ to 1 per cent. of nitrogen.

Uses, etc.—As nutritive and demulcent and as an emulsifying agent.

FUCUS.—Bladder Wrack.—The thallus of Fucus vesiculosus.

N.O.—Algæ, Fucaceæ.

Syn.—Quercus Marina, Cutweed.

Habitat.—Rocky shores of the North Atlantic and North Pacific Oceans.

Characters.—From two to four feet long, having a flat branching thallus, half to one inch wide, with the margin entire, and a distinct midrib through its entire length. The air vesicles are spherical or oblong in shape, and are usually in pairs. When fresh the colour is brownish-green, and becomes nearly black on drying. It has a peculiar seaweed-like odour and a mucilaginous and saline taste.

Chemistry.—Mucilage, mannite, odorous oil and bitter principle are present, and the dry plant yields from 14 to 20 per cent. of ash, which is rich in potassium, in combination with the halogens.

Uses, etc.—As specific against obesity ; given in extract and fluid extract. *Dose.*—60-120 grains.

GRACILARIA.—Ceylon Moss.—The dried plant (thallus) of Gracilaria (Plocaria, Sphærococcus) lichenoides and of G. confervoides.

N.O.—Algæ, Rhodophyceæ.

Syn.—Edible Moss.

Habitat.—Coasts of Ceylon and the Islands of Eastern Archipelago.

Characters.—Occurs in yellowish-white or light purple, ramifying filaments, from one to several inches in length ; at the base the larger filaments not exceeding the thickness of a crow quill, the smaller fibres being about as thick as fine sewing thread; consistence cartilaginous; odour resembling seaweed; taste mucilaginous and feebly saline.

Chemistry.—Vegetable jelly, known as pectin or *gelose* (37 to 38 per cent.), albuminoids (7·5 per cent.), ash (10·2 per cent.)

Uses, etc.—As nutritive and demulcent, similar in properties to Irish moss; official in the Indian Pharmacopœia which includes a decoction.

Note.—Corsican Moss.—This is obtained from about twenty to thirty different species of Algæ, Sphærococcus Helminthochorton being largely present. *Habitat.*—Mediterranean shores. *Characters.*—Cartilaginous, filiform, repeatedly forked, of a variable colour, from white to brown, and having the odour of seaweeds and a strongly saline and mucilaginous taste. *Chemistry.*—Mucilage and saline compounds.

LAMINARIA.—Sea Tangle.—The thallus of Laminaria digitata.

N.O.—Algæ, Phæosporeæ.

Habitat.—The shores washed by the Atlantic Ocean.

Characters.—Generally the species of this genus have a leathery or membranous flat frond, with a stalk but without a midrib. The fructification is imbedded in the frond in spots. Laminaria Digitata has a solid cylindrical stem, tapering upwards, of varying length; the frond is leathery, roundish-oblong, but when quite young, entire, rapidly becoming deeply cleft into several strips.

Chemistry.—Dry matter (78·5 per cent.), containing nitrogen (1·5 per cent.) and gelatinous and mucilaginous principles, moisture (21·5 per cent.) Laminaria saccharina yields to decoction 50 per cent. of its weight, and is said to contain 12 to 15 per cent. of mannite.

Uses, etc.—It is used in a variety of ways, but chiefly as a fuel and when young as a food. It has been recommended in cases of stricture and fistula as a dilator, and when in powder as a useful ingredient in resolvent poultices. Its stems constitute the "goître-sticks" which are chewed by the South Americans. Its ash (kelp or varec), as also that of algæ generally, is rich in iodides, bromides, and chlorides, in combination with much potassium and magnesium, and in fact constitutes the principle source of iodine.

Note.—Agar-agar is a seaweed gathered on East Indian coasts and sent to China; it is derived from various species of Sphœrococcus and Eucheuma, and is of a brownish-white colour with thorn-like projections on its branches. It is the source of Chinese gelatine, and its jelly is used for bacteriological cultures. Agar-agar contains *gelose*, which is a powerful gelatinizing agent, precipitated from solution by alcohol. Three varieties of agar-agar met with in commerce are Ceylon, Macassar and Japanese.

ADIANTUM.—Maidenhair.—The fern Adiantum Capillus-Veneris.

N.O.—Filices, Polypodineæ.

Habitat.—South of England and Europe.

Characters.—Rhizome perennial, oblique, three to four inches long, thickness of a quill, brownish, clothed with shaggy hairs and occasional slender fibres, constituting the true root. Fronds six to twelve inches long, twice or thrice pinnate, usually broadly ovate in general outline, and with a thin, slender stalk of a shining brownish-black appearance. Segments obovate or fan-shaped, half an inch broad, all narrowed at the base into a short, slender stalk, more or less divided into wedge-shaped, obtuse lobes, thin, and of a bright green, without any midrib, but numerous furcate veins converging at the base. The sori are conspicuous on the extremities of most of the segment lobes.

Uses, etc.—In pectoral complaints. The French have a Sirop de Capillaire (Syrup of Maidenhair), which is prepared from the fronds and rhizomes of this plant.

USTILAGO.—Corn Smut.—Ustilago Maydis, grown upon Zea Mays.

N.O.—Fungi, Ascomycetes.

Habitat.—United States of America.

Characters.—Iregular, globose masses, sometimes six inches thick, consisting of a blackish membrane, enclosing innumerable brownish-black, globular and nodular spores; odour and taste unpleasant. It should be preserved in a dry place, and should not be kept longer than a year.

Chemistry, uses, etc.—Similar to those of ergot.

AGARICUS ALBUS.—White Agaric.—The fungus Boletus laricis (Polyporus officinalis), found growing on the Larch (Larix).

N.O.—Fungi, Hymenomycetes.

Syn.—Fungus laricis, Purging Agaric.

Habitat.—Europe.

Characters.—Deprived of outer rind; hoof-shaped or conical, about six inches broad, usually in irregular pieces; white, light, somewhat fibrous and spongy, friable; odour faint; taste sweetish, acrid and bitter.

Chemistry.—*Agaric* (*agaricinic, laricic*) *acid* is the valuable principle. It is obtained in minute, white, lustrous crystals, slightly soluble in cold, readily in hot water. *Agaricin* is either an alcoholic extract consisting of impure agaric acid, or the two are sometimes regarded as being synonymous.

Uses, etc.—Recommended in night-sweats of pthisis; is a powerful purgative. *Dose.*—5-30 grains in powder: usually given in the form of agaric acid of which the dose is ¼-1 grain.

Note.—Allied Fungi. AGARICUS (AMANITA) MUSCARIA *(fly-agaric)*, yields the uncrystallizable alkaloid *muscarine*, the nitrate of which is used in medicine for purposes similar to pilocarpine. BOLETUS IGNIARIUS *(agaric of the oak—surgeon's agaric)* was formerly much used, after being specially prepared by peeling, etc., for stopping hemorrhage, etc. Treated with a solution of nitre, prepared agaric becomes tinder, or the *amadou* of the French.

SECTION II.

UNORGANISED DRUGS OF VEGETABLE ORIGIN.

Under this head are included vegetable secretions and such other plant products as have no definite organised structure.

1. JUICES.—SUCCI.

THE juices are met with in one of three forms. They may be liquids (lemon juice), solids (kino), or of a pasty consistence (opium). Existing in the plant as liquids, the two latter varieties reach the solid or pasty condition by evaporation, which may have been brought about by natural means (*i.e.*, by exposure to the atmosphere), as in the case of opium, or by artificial means, *e.g.*, catechu. The majority of the medicinal juices may be regarded as being derived from the laticiferous vessels of the plants which yield them, but the liquid juices (lemon juice, etc.) consist of the cell-sap of the succulent fruits, containing dissolved vegetable acids.

LIMONIS SUCCUS.—Lemon Juice.—The freshly expressed juice of the ripe fruit of Citrus Limonum.

N.O.—Rutaceæ.

Habitat.—S. Europe.

Characters.—A slightly turbid, yellowish liquid with a sharp acid taste. Specific gravity 1·035 to 1·045. Quantity of citric acid in one fluid ounce—36 to 46 grains.

Chemistry.—*Citric acid* (from 5 to 10 per cent.), gum, sugar, inorganic salts and a trace of volatile oil.

Note.—Lemon juice, which decomposes on keeping is frequently adulterated with tartaric and sulphuric acids, etc. It may be preserved by the addition of 10 per cent. of alcohol.

Uses, etc.—As refrigerant and antiscorbutic. *Dose.*—½-2 fluid ounces. The source of citric acid.

B.P. Preparation.

Syrupus Limonis - - - - 1 in 2, nearly.

OPIUM.—Opium.—The juice obtained in Asia Minor by incision from the unripe capsules of Papaver somniferum, inspissated by spontaneous evaporation. Any ordinary variety of opium may be employed as a source of alkaloids and of extract of official strength; but, otherwise used for officially recognised purposes, opium must be that obtained in Asia Minor, and must be of such a strength that, when dried and powdered, and the powder heated to 212° F. until it ceases to lose moisture, and the product tested by any trustworthy method, it shall yield as nearly as practicable 10 per cent. of morphine, that is, 100 parts of such dried powdered opium shall yield not less than 9·5 parts, or not more than 10·5 parts of morphine.

N.O.—Papaveraceæ.

Syn.—Meconium, Thebaica, Succus thebaicus.

Habitat.—Asia Minor.

Characters.—In rounded, irregularly-formed, or flattened masses, varying in weight, but commonly from 8 oz. to 2 ℔s., usually covered with portions of poppy leaves, and scattered over with reddish-brown, chaffy fruits of a species of Rumex. When fresh, plastic, and internally somewhat moist, coarsely granular and reddish or chestnut brown; but becoming harder by keeping, and darkening to blackish-brown. Odour strong, peculiar, narcotic; taste nauseously bitter.

Varieties of Opium.—The above description applies to opium produced in Asiatic Turkey, and exported from Smyrna and Constantinople; that from Constantinople differs but little from the Smyrna export except in having more marked poppy leaf and less, if any, rumex fruits.

Egyptian opium occurs in flat circular cakes, four inches or more in diameter, it never darkens in colour by age, but is always reddish-brown, and was formerly covered with the leaf of a species of plane, having parallel venation, but may now be met with enclosed in poppy leaves, but without the rumex capsules. It contains usually little more than half as much morphia as Turkey opium.

Persian or *Trebizond opium* formerly occurred in sticks about six inches long and half an inch in diameter, each enveloped in paper and tied with a little cotton, but now it may be met with in large, irregular, roundish lumps covered with paper. When cut through, the lumps frequently exhibit oily globules, which have found their way into the mass from the operator during collection using linseed oil to moisten the knife and hands. It is usually considered to be an inferior kind, but is said to have improved of late years.

Chinese or *Cannon Ball Opium*, prepared in India and sent to China, occurs in balls, weighing three to four pounds, and surrounded with poppy leaves.

Method of Production.—The incisions are made in the capsules in India vertically, in Asia Minor horizontally, and in China the capsules are punctured; care has to be taken not to incise too deeply or the juice which proceeds from the laticiferous vessels flows into the capsules and, mingling with the seeds, is spoiled. The exudation dries in about twenty-four hours, and is then collected and thrown into a mass without mixing. This feature distinguishes Smyrna opium from all others, and it is hence known as granular opium. It is enveloped in poppy leaves and the trigonal fruits of a species of rumex. In India, opium is similarly collected, but is, after removal, beaten or kneaded into a homogenous mass.

Adulteration.—This is extensively practised—leaves, bullets, stones, fruits, dèbris of all kinds, sand, extracts of the poppy and of other plants, gum arabic, tragacanth, starch, flour, aloes, grape pulp, etc., being amongst the substances made use of for this purpose.

Assay of Morphine.—The following is an abbreviated statemant of the official method :—

Test.—(1.) Rub 140 grains of dried opium (at 212° F.) with 60 grains of freshly-slaked lime ; add 400 grain measures [g.m.] of distilled water ; afterwards adding 1,000 g.m. of water, and agitate occasionally for half an hour.

(2.) Remove 1,040 g.m. (= 100 grains of the opium) by filtration.

(3.) To filtrate, add 110 g.m. S.V.R., 500 g.m. of ether, and 40 grains of chloride of ammonium. Shake well for half an hour, and set aside for twelve hours.

(4.) Remove ethereal portion on to a counterpoised filter, wash aqueous portion with 200 g.m. of ether ; romove to filter, and finally wash filter with 100 g.m. of ether. Allow filter to dry.

(5.) Now pour remaining contents of the bottle on to the filter, washing bottle with a further quantity of cold distilled water [200 g.m.]

(6.) Drain, dry and weigh in the usual way.

The precipitate, which should be soluble in caustic soda, may with advantage finally be titrated with standard acid. For a method giving higher results *see C. & D.*, 1893, i., p. 78.

Chemistry.—*Morphine*, the most important base contained in opium, was discovered in 1816, and since then the following alkaloids have also been found :—*Codeine*, *thebaine*, *papaverine*, *meconidine*, *codamine*, *laudanine*, *laudanosine*, *lanthopine*, *protopine*, *crypotopine*, *rhœadine*, *narcotine*, *oxynarcotine*, *narceine*, *pseudomorphine*, *gnoscopine*, *tritopine*, *hydrocotarnine*. There are also present sulphuric acid, *meconic acid* ($C_7H_4O_7$), lactic acid, mucilage, pectic matter, sugar, wax and three neutral principles, viz., *meconin*, *meconoiosin* and *opionin*.

Morphine, *morphia*, $C_{17}H_{19}NO_3$, is a white crystalline powder obtained by methods similar to those adopted for the assay of opium (*vide supra*). It is insoluble, or nearly so, in ether ; soluble in alkalies, in acetic ether, in boiling amylic alcohol and in oleic acid (*morphinæ oleas*). It forms crystallizable salts with acids, gives a blue colour with ferric chloride and a red when dissolved in sulphuric acid and a drop of nitric acid added. The morphia molecule contains two hydroxyl groups.

Codeine.—Codeina B.P. (*Methyl-morphine*) $C_{18}H_{21}NO_3$, is obtained from the liquors from which morphine has been removed in the manufacture of the latter. It is readily soluble in rectified spirit, in chloroform, and in 30 parts of ether.

Narcotine, $C_{22}H_{23}NO_7$, is left in opium after maceration of the drug in water, and may be removed by treating the marc with acetic acid. It has no narcotic properties.

The following table, the data for which are taken from Allen's *Commercial Organic Analyses*, vol. iii., part ii., gives the formulæ, solubilities and the more important colour reactions of the opium bases.

OPIUM BASES.—Table of Solubilities in Alcohol, Caustic Soda and Ether, and Colour Reactions with Ferric Chloride and Nitric Acid.

Alkaloid.	*Formula.*	*Solubility in*			*Reaction with*	
		Alcohol.	*Solution of Caustic Soda.*	*Ether.*	*Nitric Acid, s.g. 1·42.*	*Ferric Chloride.*
Morphine ...	$C_{17}H_{19}NO_3$.	50—100.	readily.	6100.	orange red.	greenish-blue.
Codeine ...	$C_{18}H_{21}NO_3$.	readily.	slightly.	readily.	yellow; not becoming red.	no colour.
Thebaine ...	$C_{19}H_{21}NO_3$.	10.	not.	140.	yellow; not becoming red.	no colour.
Apomorphine ...	$C_{17}H_{17}NO_2$.	readily.	soluble	very.	blood-red or reddish violet.	pink to violet to black.
Pseudomorphine ...	$C_{34}H_{36}N_2O_6$.	scarcely at all.	soluble.	not.	orange-red; becoming yellow.	blue.
Papaverine ...	$C_{20}H_{21}NO_4$.	45 cold; 4 hot.	not.	250.	yellow.	no colour.
Meconidine ...	$C_{21}H_{23}NO_4$.	readily.	not.	easily.	....	....
Codamine ...	$C_{20}H_{25}NO_4$.	readily.	soluble.	soluble.	....	....
Laudanine ...	$C_{20}H_{25}NO_4$.	sparingly.	readily.	647.	....	....
Laudanosine ...	$C_{21}H_{27}NO_4$.	readily.	not.	19.	....	....
Lanthopine ...	$C_{23}H_{25}NO_4$.	sparingly.	soluble.	sparingly.	....	....
Protopine ...	$C_{20}H_{19}NO_5$.	sparingly.	not.	sparingly.	....	....
Cryptopine ...	$C_{21}H_{23}NO_5$.	sparingly.	soluble.	soluble.	....	....
Rhœadine ...	$C_{21}H_{21}NO_6$.	scarcely at all.	not.	1280.	....	....
Narcotine ...	$C_{22}H_{23}NO_7$.	190 cold (13 hot).	not.	50.	red.	no colour.
Oxynarcotine ...	$C_{22}H_{23}NO_8$.	sparingly.	soluble.	not.	....	....
Narceine ...	$C_{23}H_{29}NO_9$.	300 cold; easily hot.	soluble.	not.	yellow; fading rapidly.	....
Tritopine ...	$C_{42}H_{54}N_2O_7$.	soluble.	soluble.	sparingly.	....	....
Gnoscopine ...	$C_{34}H_{36}N_2O_{11}$.	1500.	not.	sparingly.	....	....
Hydrocotarnine ...	$C_{12}H_{15}NO_3$.	readily.	not.	readily.	....	....

Uses, etc.—As anodyne, antispasmodic and hypnotic, etc. *Dose.*—½-3 grains in powder.

B.P. Preparations.

Acidum Meconicum.	
Codeina.	
Confectio Opii	1 part in 40, nearly.
Emplastrum Opii	1 ,, 10.
Enema Opii	1 fluid drachm tincture to 4 fluid ounces.
Extractum Opii	aqueous; yield, about 50 per cent.; (should contain 20 per cent. morphine B.P.)
Extractum Opii Liquidum	22 grains of extract in 1 fluid ounce, nearly.
Linimentum Opii	1 volume of tincture in 2 volumes.
Morphinæ Acetas.	
,, Acetatis Liquor	1 per cent. by volume.
,, Bimeconatis ,,	1 in 80.
,, Hydrochloras.	
,, Hydrochloratis Liquor	1 per cent. by volume.
,, Hypoderm Inject	10 per cent. acetate by vol.
,, Sulphas.	
,, Sulphatis Liquor	1 per cent. by volume.
Pilula Ipecucuanhæ cum Scilla	1 part in 23, nearly.
,, Plumbi cum Opio	1 ,, 8.
,, Saponis Composita	1 ,, 6, nearly.
Pulvis Cretæ Aromaticus cum Opio	1 ,, 40.
,, Ipecacuanhæ Compositus	1 in 10.
,, Kino Compositus	1 in 20.
,, Opii ,,	1 in 10.
Suppositoria Plumbi Composita	1 grain in each.
Tinctura Camphoræ Composita	2 grains to 1 fluid ounce.
Tinctura Opii	33 grains to 1 fluid ounce, nearly.
,, ,, Ammoniata	5 grains to 1 fluid ounce.
Trochisci Opii	One-tenth grain extract in each.
Unguentum Gallæ cum Opio	32 grains to 1 fluid ounce.
Vinum Opii	22 grains extract in 1 fluid ounce, nearly.

Note.—The extract of opium is a standardized preparation, the B.P. requiring it to contain 20 per cent. morphine. This percentage might be obtained from a 10 per cent. opium containing 50 per cent. soluble matter if the drug were thoroughly exhausted. In actual practice this combination is seldom if ever met with, and strengthening or diluting the extract has to be resorted to. Similarly the tincture, made by thoroughly exhausting B.P. opium would contain 0·75 per cent. of morphine, but the whole of the morphine is never removed by the B.P. process, hence a stronger opium must be used, or a larger quantity of the drug of official strength operated upon than the B.P. orders.

MORPHINE ACETAS B.P., $C_{17}H_{19}NO_3,HC_2H_3O_2,3H_2O$, is prepared dissolving precipitated morphine in acetic acid and evaporating to dryness; it is a white powder freely soluble in water.

B.P. Preparations.

Liquor Morphinæ Acetatis - - - -	1 in 100.
Injectio ,, Hypodermia - -	1 grain in 10 minims.

MORPHINÆ BIMECONATIS LIQUOR B.P. is prepared by dissolving freshly precipitated morphine in meconic acid; it is said to be specially useful as representing the natural state of combination of acid and alkaloid existing in the crude drug.

MORPHINÆ HYDROCHLORAS B.P., $C_{17}H_{19}NO_3HCl,3H_2O$, is prepared by treating an aqueous liquid extract of the drug with solution of calcium chloride. The impure hydrochlorate of morphine is then washed away from the precipitated neconate and sulphate of lime, the alkaloid precipitated by the addition of ammonia, redissolved by hydrochloric acid; the solution being finally decolourized and allowed to crystallize. The salt is obtained in white powder or in thin prisms of a silky lustre.

B.P. Preparations.

Liquor Morphinæ Hydrochloratis, about 1 in 100.
Suppositoria Morphinæ, each containing ½ grain.
,, ,, cum sapone, each containing ½ grain.
Tinctura Chloroformi et Morphinæ.
Trochcisci Morphinæ, each containing $\frac{1}{36}$ grain.
,, ,, et Ipecacuanhæ and containing $\frac{1}{36}$ grain.

MORPHINÆ SULPHAS B.P. $(C_{17}H_{19}NO_3)_2, H_2SO_4\,5H_2O$, may be obtained by a process similar to that used for obtaining the hydrochlorate, sulphuric acid being substituted for hydrochloric. It is obtained in colourless acicular crystals, soluble in about 20 parts of water.

B.P. Preparation.

Liquor Morphinæ Sulphatis - - -	1 in 100.

ACIDUM MECONICUM B.P., $H_2C_7H_2O_7, 3H_2O$, is an acid obtained from opium. It occurs in nearly colourless, micaceous crystals, sparingly soluble in water. It may be obtained by treating opium with calcium chloride or lead acetate, the precipitated meconate being decomposed by treatment with acids. It is peculiar to opium, and with ferric chloride gives a red colour.

B.P. Preparation.

Liquor Morphinæ Bimeconatis, 5½ grains of Bimeconate in 1 fluid ounce.

APOMORPHINÆ HYDROCHLORAS B.P., $C_{17}H_{17}NO_2,HCl$, is the hydrochlorate of an alkaloid obtained by treating morphine or codeine in sealed tubes with hydrochloric acid. In occurs in small, greyish-white, shining, crystals, turning green on exposure to the air. It is a powerful emetic.

B.P. Preparation.

Injectio Apomorphinæ Hypodermica, 2 grains in 100 minims.

Note.—Non-official preparations of opium. These are many, including Liquor Opii Sedativus (Battley), Sydenham's Laudanum (Tinctura Opii Crocata), Black Drop (Acetum Opii Crocatum), Linimentum Opii Ammoniatum B.P.C., etc.

ALOE SOCOTRINA.—Socotrine Aloes.—The juice, when inspissated, which flows from the transversely cut bases of Aloe Perryi, and probably other species. Imported principally by way of Bombay and Zanzibar, and known in commerce as Socotrine and Zanzibar Aloes.

N.O.—Liliaceæ.

Syn.—Hepatic aloes.

Characters.—Colour of various shades of reddish-brown, darkening by exposure to the air; fracture usually smooth and resinous, or rarely tough and irregular; in thin films transparent and orange-ruby-red or orange-brown; powder bright tawny reddish-brown; odour strong and somewhat agreeable; taste very bitter. When moistened with rectified spirit and examined in a thin stratum under the microscope, it exhibits numerous crystals. In other cases Socotrine aloes is more or less opaque and liver-coloured, and is then known as *hepatic aloes.* Almost entirely soluble in proof spirit.

Note.—Socotrine aloes is said to be prepared by natural inspissation (*i.e.*, by exposure to the air). It is imported either in monkey skins (Zanzibar aloes), or in kegs or boxes, and frequently in a semi-solid condition.

Chemistry.—*Aloin* (distinguished as *nataloin*), resin, volatile oil (traces), ash, etc. Socotrine aloes usually contains more insoluble resinous matter than the Barbadoes variety.

Uses, etc.—As purgative, etc. Not so powerful in action as Barbadoes aloes. *Dose.*—2-6 grains.

B.P. Preparations.

Aloin.	
Decoctum Aloes Compositum, made from Extract	4 grains in 1 fluid ounce.
Enema Aloes	4 ,, 1 ,,
Extractum Aloes Socotrinæ	aqueous; yield, about 50 per cent.
Extractum Colocynthidis Compositum (Extract)	1 part in 2¼, nearly.
Pilula Aloes et Asafœtidæ	1 ,, 4.
,, ,, et Myrrhæ	1 ,, 3.
,, ,, Socotrinæ	1 ,, 2, nearly.
,, Rhei Composita	1 ,, 6.
Tinctura Aloes	1 in 40 of proof spirit.
,, Benzoini Composita.	
Vinum Aloes	16½ in 40 of proof spirit.

ALOIN B.P., $C_{16}H_{18}O_7$, is a yellow, inodorous crystalline substance extracted from aloes by solvents and purified by recrystallization. As obtained from the different varieties of aloes the products differ slightly, but their medicinal properties are similar. Aloin is freely soluble in hot water and in hot alcohol; little soluble in cold alcohol, less so in cold water, and insoluble in ether. It is not readily altered in acidified or neutral solutions; rapidly altered in alkaline fluids. The three varieties of aloin are:—

Barbaloin (α-barbaloin), $C_{16}H_{18}O_7$, from Barbadoes and Curaçoa aloes, is the aloin of commerce; it yields, on oxidation, *aloetic*, *chrysammic*, oxalic and picric acids. It gives a red colour with fuming nitric acid and, under the action of reducing agents, yields anthracene.

Socaloin (β-barbaloin), $C_{16}H_{18}O_7$, from Socotrine and Zanzibar aloes, gives a red coloration with hot or fuming nitric acid.

Nataloin, $C_{25}H_{28}O_{11}$, from Natal aloes only, yields, on oxidation, picric and oxalic acids, and, like barbaloin, gives a red colour with cold nitric acid; it may be distinguished from the latter, however, by giving a blue colour when moistened with sulphuric acid and brought into contact with the fumes of nitric acid.

Note.—Aloe purificata, U.S.P., is obtained by melting socotrine aloes, liquefying it by the addition of alcohol, straining and evaporating.

ALOE BARBADENSIS—Barbadoes Aloes.

The juice, when inspissated, which flows from the transversely cut bases of the leaves of Aloe vulgaris (A. vera, A. barbadensis). Imported from Barbadoes and the Dutch West Indian Islands, and known in commerce as Barbadoes and Curaçoa Aloes.

N.O.—Liliaceæ.

Habitat.— Barbadoes.

Characters.—Colour varying from deep reddish-brown or chocolate-brown to dark brown or almost black; fracture usually dull and waxy, or sometimes smooth and glassy. Opaque in mass, but in thin films, translucent, and of an orange-brown tint; powder dull olive-yellow. Odour strong and disagreeable; taste bitter and nauseous. The Curaçoa variety is commonly more glassy and translucent than the ordinary Barbadoes kind, and has a distinctive odour. When moistened with rectified spirit and examined in a thin stratum under the microscope, it exhibits numerous crystals. Almost entirely soluble in proof spirit.

Note.—The leaf of the Aloe vulgaris is succulent, and beneath the epidermis are to be found long parallel tubes containing a colourless juice, which, when thickened by solar or artificial heat, constitutes aloes. This variety is not translucent at the edges of the pieces. Barbadoes aloes is largely prepared by the evaporation of a decoction of the leaves; it is usually imported in gourds or boxes.

Chemistry.—Aloin (20-25 per cent.), a trace of volatile oil, resin and ash. The variety of aloin present in Barbadoes aloes is distinguished by the name *barbaloin*, and by giving with cold nitric acid a rapidly fading vivid crimson colour. The so-called resin of aloes is insoluble in cold water, and hence is absent from the official extract.

Uses, etc.—As purgative, usually given in combination with other medicines. *Dose.*—2-6 grains.

B.P. Preparations.

Aloin.	
Enema Aloes - - - - -	4 grains in 1 fluid oz.
Extractum Aloes Barbadensis -	aqueous; yield, about 75 per cent.
Pilula Aloes Barbadensis - -	1 part in 2, nearly.

Pilula Aloes et Ferri	1	part in	$5\frac{1}{4}$.
,, Cambogiæ Composita	1	,,	6, nearly.
,, Colocynthidis Composita	1	,,	3, ,,
,, ,, et Hyoscyami	1	,,	$4\frac{1}{2}$, ,,

Note.—Curaçoa aloes is the product of ALOE CHINENSIS, and this variety, which resembles true Barbadoes aloes in appearance, but differs from it in odour, to a large extent now replaces the latter in commerce.

ALOE CAPENSIS.—Cape Aloes.—The inspissated juice of the leaves of Aloe spicata and probably other species as A. ferox, A. africana, A. platylepsis, etc.

N.O.—Liliaceæ.

Habitat.—South Africa.

Characters.—In dark greenish-brown (almost black) brittle lumps of irregular form, breaking with a glassy or conchoidal fracture; thin splinters, when viewed by transmitted light are seen to be of amber colour, and transparent. The powder is of a pale greenish-brown colour. Odour strong and peculiar, more like Socotrine than Barbadoes aloes, but readily distinguished from either.

Uses, etc.—Similar to the official kinds ; included in many of the Continental Pharmacopœias. *Dose.*—2-6 grains.

Natal aloes is a variety imported from Natal ; it differs in appearance from ordinary Cape aloes in being opaque and thus having "hepatic" characters. It contains a distinctly crystalline principle (*see* Nataloin *above*), and is probably derived from ALOE SUCCOTRINA.

Jafferabad aloes, supposed to be the same as *Mocha aloes*, is of a black pitch-like colour, and a glassy, somewhat porous fracture ; it is the product of A. ABYSSINICA, and is imported from Arabia.

Musambra aloes is made in India from Aloe vulgaris.

Caballine aloes (Horse aloes) was the name formerly applied to an inferior, dark-coloured, disagreeable-smelling aloes, largely used for veterinary purposes.

KINO.—Kino.—The juice obtained from incisions made in the trunk of Pterocarpus Marsupium, inspissated without artificial heat.

N.O.—Leguminosæ.

Habitat.—Malabar.

Characters.—In small, angular, glistening, opaque, reddish-black, brittle fragments, which, in thin laminæ and at the edges, are transparent and ruby-red ; inodorous, very astringent, and when chewed sticking to the teeth and tinging the saliva blood-red. Almost entirely soluble in rectified spirit. It yields little or nothing to ether.

Chemistry.—*Kino-tannic acid*, gallic acid, *kinoic acid*, pectin (70 to 75 per cent.), *pyrocatechuic acid*, ash, etc. *Kinoin*, a crystalline, colourless substance and *kino-red*, its anhydride, are also present in some kinos.

Uses, etc.—As astringent, etc. *Dose.*—10-30 grains.

B.P. Preparations.

Pulvis Catechu Compositus	1 part in 5.
,, Kino Compositus	3¾ parts in 5.
Tinctura Kino	1 in 10 of a mixture of glycerine, water and rectified spirit.

Note.—KINOS.—The word kino is a generic term applied to many astringent gums and inspissated juices. In addition to the official East Indian or Malabar kino the following may be mentioned:—*West India* or *Jamaica Kino*, the product of COCCOLOBA UVIFERA—(*N.O.*—Polygonaceæ; sea-side grape),—is dark-brown red in colour, almost entirely soluble in water and rectified spirit. It is said to be prepared by evaporating a decoction of the wood and bark of the tree. *South American Kino*, *Caraccas Kino*, is probably identical with West India Kino. *African Kino*, Gambian Kino (PTEROCARPUS ERINACEUS), was the substance first introduced as kino by Dr. Fothergill. It is now no longer met with. An African kino, said to be derived from BRACHYSTEGIA SPICÆFORMIS, has lately been described: it is highly astringent and gives a brighter solution than the official variety. *Butea*, *Bengal* or *Palas Kino* is the product of BUTEA FRONDOSA, and occurs in stalactiform pieces of a ruby red colour, transparent almost entirely soluble in water, and yielding 73 per cent. of tannic acid. *Angophora Kino.*—Certain species of Australian angophoras (A. LANCEOLATA, etc.) yield kinos similar in composition to others of the class, but possessing a marked odour.

GUTTA PERCHA.—Gutta Percha.—The concrete juice of Dichopsis Gutta (Isonandra Gutta), and of several other trees of the same natural order (Sapotaceæ).

N.O.—Sapotaceæ.

Habitat.—Singapore and Borneo.

Characters.—In pieces of a dark-brown or chocolate colour, tough, somewhat flexible; plastic above 120° F. (48°·8 C.) Insoluble in water, alcohol, alkaline solutions or dilute acids; but almost entirely soluble in chloroform, and entirely so in oil of turpentine, carbon disulphide and benzol.

Note.—Its collection by the Malays is effected by felling the trees immediately after the rainy season. The branches are removed and the bark cut away in strips, a vessel being placed below each incision to catch the laticiferous exudation. The milky juice rapidly condenses and assumes colours which vary according to the amount of admixture of fragments of bark and other foreign matters. The mass is finally boiled with water or with water containing lime-juice or cocoa-nut oil.

Chemistry.—Gutta percha consists essentially of *gutta*, a hydrocarbon ($C_{10}H_{16}$), with varying quantities of the resins *alban* and *fluavil*, which are probably oxidation products of the first-named body.

Uses, etc.—On account of its plasticity, firmness and impenetrability by water and alcohol, gutta-percha, plain or vulcanized, fills many useful purposes in the arts. In medicine it is used as a protective agent for wounds and for making bougies, pessaries, etc.

B.P. Preparation.

Liquor Gutta-Percha	1 in 8 of chloroform.

Note.—*Balata* is the concrete juice of the *Bully tree* (SAPOTA MULLERI), imported into England from Dutch Guiana; it much resembles gutta-percha. *Traumaticine* is a solution of gutta-percha tissue in chloroform and is used for medicated applications.

CATECHU.—Catechu.—An extract of the leaves and young shoots of Uncaria Gambier.

N.O.—Rubiaceæ.

Syn.—Catechu Pallidum, Terra Japonica, Gambier.

Habitat.—Singapore and other places of Eastern Archipelago.

Characters.—In cubes or masses of variable size formed of more or less agglutinated cubes. The separate cubes are usually about an inch square on each side, deep reddish-brown externally, pale cinnamon-brown internally, dry, breaking readily with a dull earthy fracture, and when viewed under the microscope presenting myriads of very small acicular crystals. Taste at first bitter and very astringent, but subsequently sweetish ; no odour. Entirely soluble in boiling water. The decoction when cool is not rendered blue by iodine.

Chemistry.—*Catechu-tannic acid* 40 per cent., *catechin (catechuin, catechuic acid)*, gummy extractive, lignin, etc. Catechin is white, crystalline, soluble in alcohol, in ether, and in boiling water. The ash should not exceed six per cent.

Uses, etc.—Tonic and astringent. *Dose*—10-30 grains. Largely made use of in tanning and dyeing.

B.P. Preparations.

Infusum Catechu - - - -	16 grains to 1 fluid ounce.
Pulvis Catechu Compositus -	1 part in 2½.
Tinctura Catechu - - - -	1 in 8 of proof spirit.
Trochisci Catechu - - - -	1 grain in each lozenge.

CATECHU NIGRUM.—Black Catechu.—An aqueous extract obtained from the wood of Acacia catechu, a small tree.

N.O.—Leguminosæ.

Syn.—Black or Pegu Catechu, Cutch.

Habitat.—Burmah, India, etc.

Characters.—It is of a dark colour, hard and brittle, dissolves slowly in the mouth ; its fracture has a frothy, porous, or bubble-like appearance, which is due to a kind of fermentation. Should contain not more than 15 per cent. of matters insoluble in alcohol.

Note.—The heart-wood boiled with water, the decoction evaporated until thick, and poured into clay or leaf moulds and dried, yields the substance known in commerce as the above. The word *catechu* means the juice of a tree, but is usually applied to astringent extracts obtained from various plants.

Chemistry.—*Catechu-tannic acid* (45 per cent.), *catechin*, *catechu-red* (an anhydride of catechin), etc.

Uses, etc.—As Catechu Pallidum (*q.v.*) *Dose.*—10-30 grains. Official in the United States, where it is regarded as being superior to the British official catechu.

Note.—ALLIED DRUGS.—The following varieties of Catechu are described as being imported into the United States, all of them being official :—*Cake Catechu* from East Indies, *Pegu Catechu* from Burmah, *Bengal Catechu*, in quadrangular cakes, *Ball Catechu*, said to come from Bombay.

Areca Catechu is obtained by boiling the betel nut (*see* Areca—under "Seeds").

MORI SUCCUS.—Mulberry Juice.—The juice of the ripe fruit of Morus nigra.

N.O.—Urticaceæ.

Habitat.—Northern Asia Minor and Europe; grown also in Britain.

Characters.—Of a dark violet or purple colour, with a faint odour, and a refreshing, acidulous, saccharine taste. Specific gravity about 1·060.

Chemistry.—Sugar, citrates, malates, etc.

Uses, etc.—Refrigerant and flavouring agent.

B.P. Preparation.—Syrupus Mori.

EUCALYPTI GUMMI.—Eucalyptus Gum. A ruby-coloured exudation or so-called red gum from the bark of Eucalyptus rostrata and some other species. Imported from Australia.

N.O.—Myrtaceæ.

Syn.—Red Gum.

Habitat.—Australia.

Characters and Tests.—From 80 to 90 per cent. of it is soluble in cold water, forming a neutral solution. It is almost entirely soluble in rectified spirit.

Chemistry.—Catechin, pyrocatechin and kinoin, and in some species a volatile oil.

Uses, etc.—As astringent in diarrhœa and in the form of lozenge for sore throat, etc. *Dose.*—2-10 grains.

Note.—Non-official liquid extract, tincture, syrup and lozenges are prepared.

CURARA.—Curare.—The inspissated juices, mixed with other substances, of the bark of Strychnos Castelnœana, S. toxifera and of other plants.

N.O.—Loganiaceæ.

Syn.—Woorare, etc.

Habitat.—Brazil and Guaina.

Characters.—Brownish-black, brittle, extractiform, almost entirely soluble in water, sparingly soluble in alcohol.

Note.—Curare is an arrow-poison and varies much in strength. Four or more varieties are made—a different species of strychnos being probably used in each case. The method of preparation consists in making a decoction or infusion and evaporating to dryness. In addition to the various species of Strychnos the plants Cocculus toxiferus, Malouetia nitida (*Guachamaca*) are said to enter into its composition.

Chemistry.—*Curarine*, $C_{18}H_{35}N$ (a crystalline alkaloid), resin, gums, etc.

Uses, etc.—As nervous sedative in tetanus, etc. *Dose.*—$\frac{1}{12}$ to $\frac{1}{2}$ grain. But little toxic when swallowed; highly poisonous when injected into the blood. The B.P.C.F. includes a hypodermic injection (1 in 12).

MONESIA.—Monesia.—An extract from various parts of the plant Chrysophyllum glycyphlœum.

N.O.—Sapotaceæ.

Habitat.—South America.

Characters.—In cakes of rather more than one pound in weight, from three-quarters to one inch in thickness, of dark brownish-black colour, very brittle and of a fracture neither dull nor lustrous; taste at first sweet, then astringent, finally acrid; entirely soluble in water.

Chemistry.—*Monesia-tannic acid, monesin* (identical with saponin), *lucumin*, glycyrrhizin, fat, etc.

Uses, etc.—Stomachic, mild astringent, and for outward application.

ELASTICA.—Caoutchouc, India-Rubber.—The concrete juice of various species of Hevea (*N.O.*—Euphorbiaceæ) and of other plants; known in commerce as Para rubber.

Habitat.—Brazil, etc.

Characters.—In cakes, balls or hollow, bottle-shaped pieces, externally brown to brownish-black, internally brownish or of a lighter tint; very elastic; insoluble in water, diluted acids or diluted solutions of alkalies; soluble in chloroform, carbon disulphide, oil of turpentine, benzin and benzol; melts at about 125° C. to a soft, adhesive mass. Odour faint, peculiar; almost tasteless. When pure floats on water (s. g. ·925).

Note.—Mode of Collection.—The trees are incised with a tomahawk and tin cups attached below the incisions by means of balls of clay. The contents of the cups are finally bulked and dried by being held on wooden shovels in the smoke of a wood fire. The caoutchouc of Para is most valuable, after which come those from Ceara and Madagascar.

Chemistry.—Pure caoutchouc consists of one or more hydrocarbons (Carbon, 87·27, Hydrogen, 12·73) and a small percentage, usually not more than 1 or 2 per cent., of a resinous substance soluble in alcohol. On dry distillation caoutchouc yields certain hydrocarbons, viz., *isoprene*, C_5H_8, *caoutchene*, *caoutchin*, etc.

Uses, etc.—For purposes similar to those described under Gutta-percha. When treated with about one-tenth of its weight of sulphur it becomes vulcanized, and is no longer soluble in the liquids which dissolve it in its natural condition. Vulcanite or ebonite is a super-sulphurated caoutchouc.

2. GUMS.

The Gums made use of in medicine are vegetable carbohydrates, insoluble in alcohol and ether, but soluble in, or swelling when treated with, water. They are usually spontaneously exuded from the bark of the trees which yield them, and frequently owe their origin to the degradation of the cellular tissues of the plant. They are in most cases capable of conversion into sugars by treatment with dilute acids, and into oxalic and mucic acids when acted upon by oxidising agents.

ACACIÆ GUMMI.—Gum Acacia.—A gummy exudation from the stem and branches of Acacia Senegal (A. verek), and from other species of Acacia.

N.O.—Leguminosæ.

Syn.—Gum Arabic.

Habitat.—Kordofan and North Africa.

Characters and Tests.—In roundish, ovoid, or vermicular tears, or masses of various sizes; or in angular fragments with glistening surfaces; colourless, or with a yellowish, brownish, or reddish tint. The tears either opaque from numerous minute fissures and very brittle, or more or less transparent and not readily broken ; the fractured surfaces vitreous in appearance. Taste bland and mucilaginous ; without odour ; insoluble in alcohol, but entirely soluble in water, and forming a clear mucilaginous solution. The aqueous solution forms with subacetate of lead an opaque white jelly. If an aqueous solution of iodine be added to the powder, or to a solution formed with boiling water and cooled, there is no appearance of a violet or blue colour.

VARIETIES AND SUBSTITUTIONS :—

Kordofan or *Hashabi Gum* (the official variety) is the finest of the Turkey or Egyptian gums, so-called because exported from Alexandria and other Egyptian ports, and usually assorted in the Medditerranean ; gums which come into commerce slightly inferior to it in value are the *Sennari* and *Suakim* or *Talca gums* ; the latter is obtained from A. STENOCARPA, A. FISTULA, etc., and is remarkable for its brittle character. Egyptian gums have been scarce since the last Soudan war, and what Kordofan gum has come into commerce has been probably by way of Indian ports.

Morocco, Mogadore or *Brown Barbary Gum*, from A. ARABICA or A. NILOTICA. Brown pieces, very brittle, sometimes in tears.

East Indian Gum (*Amrad* or *Babool*, etc., A. ARABICA et species variæ). Principally imported from Bombay, although the product of Eastern Africa. Varies in appearance, and is frequently a mixture of different gums.

Cape Gums (A. HORRIDA). An amber-brown coloured inferior gum.

Australian or *Wattle Gum* (A. PYCNANTHA, A. DEALBATA, A. HOMALOPHYLLA, etc.) Found in large tears or masses of a dark yellow or red brown colour, transparent, nearly free from cracks, readily soluble in water, very adhesive. Sometimes contains a little tannic acid.

Ghatti Gum is a variety exported from East India, said to be yielded by ANOGEISSUS LATIFOLIA ; it is superior in adhesive power to gum arabic.

Chemistry.—Pure gum arabic consists of the calcium, potassium and magnesium salts of *gummic* or *arabic acid* ($C_6H_{10}O_5$), with moisture and a trace of sugar. *Arabic acid* may be separated from its salts by acidifying a solution of gum in water. By treating gum with diluted sulphuric acid *arabin-sugar* or *arabinose* is produced ; this reduces Fehling's solution. By prolonged heating, gum becomes converted into *metarabic acid* identical with the *cerasin* of cherry gum.

Uses, etc.—Besides being largely used in the arts, gum acacia is useful in medicine as a demulcent, etc.

B.P. Preparations.

Mistura Cretæ	1 part in 34.
,, Guaiaci	1 ,, 85.
Mucilago Acaciæ	1 ,, 2½.
Pulvis Amygdalæ Compositus	1 ,, 13.
,, Tragacanthæ Compositus	1 ,, 6.
Trochisci, in all.	

Note.—A syrup of gum for demulcent purposes is included in the U.S.P.

TRAGACANTHA.—Tragacanth.—A gummy exudation obtained by making incisions in the stem of Astragalus gummifer, and some other species of Astragalus.

N.O.—Leguminosæ.

Syn.—Gomme Adragante ; Gum Dragon.

Habitat.—Asia Minor.

Characters.—In white or somewhat yellowish flaky pieces of varying length and breadth, which are thin, irregularly oblong or roundish, more or less curved, marked on the surface by arched or concentric ridges, somwhat translucent, tough, but rendered more pulverisable at a temperature of 120° Fahr. (48°·9 C.) ; inodorous and almost tasteless. It is very sparingly soluble in cold water, but swells into a gelatinous mass which is tinged violet or blue by tincture of iodine. After maceration in cold water the fluid portion is not precipitated by the addition of rectified spirit.

Varieties.—Three varieties have been described, viz., the official *flake* or *leaf tragacanth*, *vermiform tragacanth*, consisting of coiled and contorted string-like pieces and *common tragacancth*, *small tragacanth* or *sorts* which occurs in variously shaped tear-like pieces more or less brown in colour.

Note.—Tragacanth is regarded not as a secretion of the plant but as a degradation product produced by the transformation of the cells of the pith and neighbouring medullary rays.

Chemistry.—Tragacanth contains two gums, the one, *tragacanthin* (40 per cent.), said to be identical with bassorin, insoluble, but swelling in water, the other an arabin-like gum soluble in water, but, unlike arabin, yielding no precipitate with ferric chloride.

Uses, etc.—As demulcent ; yields a highly tenacious mucilage valuable for suspending insoluble powders in liquids. *Dose.*—10 to 20 grains.

B.P. Preparations.

Confectio Opii - - - - - -	1 part in 120, nearly.
,, Sulphuris - - -	1 ,, 246.
Glycerinum Tragacanthæ.	
Mucilago Tragacanthæ - -	60 grains to 10 fluid [ounces.
Pulvis Opii Compositus - -	1 part in 30.
,, Tragacanthæ Compositus	1 ,, 6.

Note.—Adulterations, Substitutions and Allied Gums.—*Bassora*, *Moussel (Hog gum)* and *Caramania gums*, or allied gums, are dark-coloured varieties imported from Persia, never in flakes, and are faced with white lead. This injurious fraud is detected by applying the usual tests for lead salts to a solution in diluted nitric acid. Bassora gum consists of bassorin (insoluble) and arabin (soluble). *Cherry gum*, from cherry and plum trees, is a partially soluble gum. An East African gum resembling tragacanth, and said to be obtained from a species of Sterculia, has recently been described. It occurs in flat pieces or in tears and consists largely of bassorin.

3. RESINS.—RESINÆ.

These are solid or semi-solid secretions or excretions of plants usually existing in the latter as oleo-resinous juices, and frequently occurring either as natural exudations or obtained by incision from the trunks of the trees which yield them. They often contain traces of the volatile oils with which they are associated in their natural condition. Resins are insoluble in water, but generally soluble in alcohol, ether, volatile oils, and some (resin-acids) in alkalies yielding resin soaps.

GUAIACI RESINA.—Guaiacum Resin.—

The resin obtained from the stem of Guaiacum officinale, or of Guaiacum Sanctum, by natural exudation, by incisions, or by heat.

N.O.—Zygophylleæ.

Syn.—Resina Guajaci, P.G.

Habitat.—St. Domingo and Jamaica.

Characters.—In roundish or somewhat oval tears, or more commonly in large masses, containing fragments of bark, wood, and other impurities; brownish or greenish-brown externally, and, when the surface has been rubbed and exposed to air and light, covered with a green powder. It is brittle, breaking with a clear glassy fracture; thin splinters are transparent and greenish-brown; powder greyish, but by exposure becoming green. Odour somewhat balsamic, and when chewed leaving an acrid sensation in the throat. A solution in rectified spirit strikes a clear blue colour when applied to the inner surface of a paring of a raw potato.

Note.—The method of obtaining the resin by heat is to take convenient lengths of the wood and bore a hole through the centre in the direction of its length by means of an augur; one end is then placed in a fire and at the other is presented a vessel to receive the molten resin which runs through the hole as the wood burns. Another method sometimes adopted is that of boiling the logs in strong salt water. A saturated brine solution may be serviceable in two ways; first, its boiling point would be about 106·6° C., and, second, such a solution is less likely than water alone to dissolve out and so remove any of the constituents of the resin.

The test with the potato depends on the action which the alcoholic solution of Guaiacum resin has on the gluten contained in the tuber. This nitrogenous constituent is found in greatest quantity near the "eyes" or buds. The resin is useful as a test for the presence of blood, with the red colouring matter of which, in the presence of ozonic ether, it produces a blue colour. Guaiacum resin is soluble in acetone, methylic, ethylic and amylic alcohols, chloroform, creasote, caustic alkaline solutions, sal volatile and oil of cloves. It is also partially soluble in bisulphide of carbon and benzol and insoluble in hot turpentine.

Chemistry.—*Guaiconic acid*, *guaiaretic acid* (both crystalline and saponifiable), *guaiac beta-resin*, gum, *guaiacic acid*, *guaiac-yellow*. On destructive distillation the resin yields *guaicene*, *guaiacol*, *creosol* and *pyroguaiacin*.

Uses, etc.—Stimulant, diaphoretic; employed in rheumatism. *Dose.*—10-30 grains.

B.P. Preparations.

Mistura Guaiaci	11 grains in 1 fluid ounce.
Pilula Hydrargyri Subchloridi Composita	1 part in 2½.
Tinctura Guaiaci Ammoniata	1 in 5 of aromatic spirit of ammonia.

Note.—Adulteration with turpentine resin is sometimes practised. The latter is soluble in hot oil of tupentine; guaiacum is not. Paper moistened with tincture of guaiacum and exposed to fumes of nitric acid becomes blue; this is a highly characteristic test.

BENZOINUM.—Benzoin.—A balsamic resin obtained from Styrax Benzoin and probably from one or more other species of Styrax. It is generally procured by making deep incisions in the bark of the trees, and allowing the liquid that exudes to concrete by exposure to the air.

N.O.—Styraceæ.

Syn.—Gum-Benjamin; Benzoe.

Habitat.—Siam and Sumatra.

Characters.—In masses composed of loosely agglutinated tears, or more generally the tears are closely compacted together by a deep amber-brown, reddish-brown, or greyish-brown, translucent substance. In some specimens the tears are an inch or more in length, and when first broken they have an opaque milk-white appearance, so that the masses then present an almond-like character; while in others the white substance is very small in amount, and the masses when broken resemble reddish-brown granite. Benzoin is very brittle, softens readily by the warmth of the mouth; gives off, when heated, fumes of benzoic acid; has very little taste, but an agreeable balsamic odour resembling vanilla, or, in some cases, storax. It is soluble in rectified spirit and in solution of potash.

VARIETIES.—*Sumatra benzoin* occurs in large rectangular blocks, marked with the impression of a mat and covered with a white cotton cloth. When broken, few, but large, white tears are to be seen in it; it is generally made up of brown resiniform matter of a darker colour than the above, with small pieces or chips intermixed, which give it a granite-like appearance. Its odour is weaker and less agreeable than that of the Siam variety. It is erroneously called a "gum."

Siam benzoin is the finest variety and is derived from an unknown species of Styrax. It occurs in tears or masses of loosely-agglutinated tears of a yellow-reddish or brown colour externally, and translucent, milk-white or almond-like internally. It is never enveloped in calico. This variety may occur in lumps of a brownish-colour, which, when broken, present an amygdaloid appearance from the white tears imbedded in the mass.

Penang benzoin resembles the Sumatra variety, being produced in the same locality, but has a storax-like odour; it is said to be derived from species other than S. BENZOIN, as also is the similar and equally less valuable *Palembang* benzoin, which contains no cinnamic acid.

Note.—Incisions are made in the tree when it is seven years old. Each tree in Sumatra yields about three pounds annually for a period of ten to twelve years. The finest, which is the product of the first three years, is called *head benzoin*, the subsequent runnings yield the *belly*, and when the tree is cut down and resin removed by scraping, this constitutes the *foot*, and is very inferior. The ratio of value of these three is as 102 : 45 : 18.

Chemistry.—Benzoic acid (13-15 per cent.) in all the varieties, cinnamic acid in Sumatra benzoin, several resins, vanillin in Siam benzoin, and, in all, traces of volatile oil. On destructive distillation styrol and pyrocatechin are obtained. Cinnamic acid may be detected by treating the drug with soda solution, filtering and boiling the filtrate with potassium permanganate, when the odour of bitter almonds is produced.

Uses, etc.—Stimulant and expectorant : externally a styptic. When added to fats retards their oxidation, and hence prevents rancidity.

B.P. Preparations.

Acidum Benzoicum.	
Adeps Benzoatus - - -	1 part in 50.
Tinctura Benzoini Composita	1 in 10 of rectified spirit.
Unguentum Cetacei.	

Note.—A simple tincture of benzoin is included in the B. P. C. F. The compound tincture is unofficially known as *Friar's Balsam.*

Acidum Benzoicum, B.P.—Benzoic acid, $C_6H_5,COOH$, is described by the Pharmacopœia as an acid obtained from Benzoin and prepared by sublimation ; not chemically pure. It occurs in light, feathery, crystalline plates and needles, which are flexible, nearly colourless, and have an agreeable aromatic odour resembling that of Benzoin. Melts at 120° C. and boils at 239° C. Prepared according to the B.P. process the result is a mixture of benzoic and cinnamic acids with other impurities, varying according to the nature of the drug operated upon. The bulk of the acid found in commerce is obtained by other means or from other sources, *e.g.* (*a*), by treatment of benzoin with lime and subsequent precipitation by an acid (*b*) from the urine of horses (containing hippuric acid (*c*) from toluene. The pure acid is soluble in 400 parts of cold water, in 12 parts of hot water, readily in alcohol, in ether and in chloroform.

B.P. Preparation.

Trochisci Acidi Benzoici each containing ½ grain.

PIX BURGUNDICA.—Burgundy Pitch.—

The resinous exudation obtained from the stem of Pinus Picea (Pinus Abies, Abies excelsa), melted and strained.

N.O.—Coniferæ.

Syn.—Spruce-fir resin.

Habitat.—Austria and Finland.

Characters.—Hard and brittle, yet gradually taking the form of the vessel in which it is kept ; somewhat opaque, dull reddish-brown or yellowish-brown, fracture clear and conchoidal. Odour agreeable and aromatic, especially when heated ; taste sweet, aromatic, without bitterness. Readily soluble in glacial acetic acid and in rectified spirit.

Chemistry.—Volatile oil (small quantity) and resin, consisting chiefly of *pimaric acid* ($C_{20}H_{30}O_2$). The resin is entirely soluble in 20 parts of rectified spirit, and nearly so in 1½ parts of glacial acetic acid.

Uses, etc.—Externally in the form of plaster or ointment as stimulant and slight rubefacient.

B.P. Preparations.

Emplastrum Ferri - - - - - -	1 in 5½.
Emplastrum Picis - - - - -	1 in 2, nearly.

Note.—The term "Burgundy" is now at any rate a misnomer, since none is obtained from that province. A fictitious Burgundy pitch is prepared by melting together resin palm oil and American turpentine; this is only partially soluble in rectified spirit.

GUMMI JUNIPERI.—Sandarac.—The resin obtained as a spontaneous exudation, or by incisions from Callitris Quadrivalvis (Thuja articulata).

N.O.—Coniferæ.

Syn.—Gum Juniper.

Habitat.—Mogadore.

Characters.—Occurs in brittle, elongated tears, of a pale yellowish colour, with a dusty surface; the fracture is glass-like and transparent. It is almost entirely soluble in alcohol, and becomes pulverulent when masticated.

Chemistry.—Consists of at least three resins, one of which is identical with *sandaricin.*

Uses, etc.—Formerly given internally, and also used in ointments and plasters; its chief application is as a varnish. In the form of powder (*pounce*) it was once much used to dust on fresh manuscripts to prevent the ink from running.

Note.—The term "Juniper gum" is a misnomer, sandarac being quite distinct from the oleoresinous exudation of Juniperus communis *q.v.*

MASTICHE—Mastich.—A concrete resinous exudation obtained by making incisions in the bark of the stem and large branches of Pistacia Lentiscus.

N.O.—Anacardiaceæ.

Habitat.—Island of Scio.

Characters.—In rounded, irregular, oblong, or pear-shaped tears, of a pale yellow colour, and either opaque and dusty on their outer surface, or far more frequently having a glassy and transparent appearance; brittle, and breaking with a vitreous, conchoidal, pale-yellow fracture. Odour agreeable, somewhat balsamic and terebinthinous; taste mild and resinous; becoming plastic when chewed; entirely soluble in ether.

Note.—The incisions are made vertically—a healthy plant yielding from ten to twelve pounds.

Chemistry.—A minute quantity of volatile oil; resin, known as *masticic acid*, which is soluble in alcohol (90 per cent.); resin *(masticin)* 10 per cent., insoluble in alcohol, but soluble, as is also the previous one, in ether and turpentine. S.G. 1·095. Mastic is soluble in half its volume of ether and of chloroform.

Uses, etc.—Is a mild stimulant, rarely used except in dentistry, and for preparing varnishes and cements.

Adulterations.—(1) Gum Juniper or Sandarac, a product of the coniferous plant Callitris Quadrivalvis (*see above*). It does not become plastic when chewed, and the tears are more elongated. (2) Olibanum (*which see*). (3) Pseudo-mastich, an exudation from ATRACTYLIS GUMMIFERA, occurs in oblong and thick agglutinated tears, and is insoluble in alcohol.

RESINA.—Resin.—The residue left after the distillation of the oil of turpentine from the crude oleo-resin (turpentine) of various species of Pinus.

N.O.—Coniferæ.

Syn.—Colophony resin.

Habitat.—America.

Characters.—Translucent, yellowish, compact, brittle, pulverisable; fracture shining; odour and taste faintly terebinthinate. It is easily fusible, and burns with a dense yellow flame and much smoke. Soluble in ether, alcohol, volatile and fixed oils, chloroform, benzol and alkalies.

Note.—The *black* and *white* or *amber* colophony resins differ only in colour and this difference is due to the variation of the amount of heat used in their preparation from the crude oleo-resin, which, by distillation, yields turpentine and leaves *rosin.* The name Colophony is taken from the Greek town Colophon, where the resin was formerly prepared.

Chemistry.—*Abietic anhydride*, $C_{44}H_{62}O_4$ (80 to 90 per cent.), yielding, when warmed with dilute alcohol, *abietic acid*, $C_{44}H_{64}O_5$. *Sylvic acid* and *pinic acid*, formerly regarded as constituents of resin, are now looked upon as decomposition products or impure forms of abietic acid. Resin soaps are prepared by boiling colophony with alkalies.

Uses, etc.— Externally, as an ingredient of ointments and plasters, which it renders stimulating and adhesive.

B.P. Preparations.

Emplastrum Resinæ - - - -	1 in 9½.
Unguentum Resinæ - - - -	1 in 3¾.

Contained also in Unguentum Terebinthinæ, Charta Epispastica and in many of the plasters.

Note.—*Rosin Oil* is a mixture of hydrocarbons, obtained by the dry distillation of rosin. It is collected in two fractions, the heavier of which, on account of its readily resinifiable nature, has been used to adulterate drying oils.

DAMMARA.—Dammar Resin.—A resin obtained (1) in the East Indies as a spontaneous exudation from Pinus Dammara (Dammara Orientalis) or (2) as a fossil resin in New Zealand from Dammara Australis.

N.O.—Coniferæ.

Syn. of (2).—Australian Copal or Dammar, Kawrie or Cowdie Gum.

Habitat.—(1) East Indies. (2) New Zealand.

Characters.—In transparent, straw-coloured, roundish masses, melting at about 120° C.; nearly odourless and tasteless; partially soluble in alcohol, more so in ether, and almost completely in fixed and volatile oils; entirely soluble in sulphuric acid.

Chemistry.—Two resins, *dammarylic acid* and the same acid in an anhydrous condition have been described, and, according to some authorities, a hydrocarbon *dammaryl* is present.

Uses, etc.—As an ingredient of varnishes, rarely used in pharmacy.

COPAL.—Copal.—The concrete recently exudated or fossil juice of various trees, of which the exact botanical origin is unknown.

Syn.—Gum Animi, Animi Resin.

Habitat.—Africa, Brazil, West Indies, etc.

Characters.—Varying much according to source; generally in roundish, irregular, or flattish pieces, often rough on the surface; colourless, yellowish or brownish-yellow, more or less transparent; hard, with a shining conchoidal fracture; inodorous and tasteless; of a S.G. 1·045 to 1·139; insoluble in alcohol; partially soluble in ether and in oil of turpentine. When heated it undergoes a chemical change, gives off gases and becomes readily soluble in the two latter-named solvents.

Chemistry.—Consists of a mixture of five resins, and when distilled yields a terpene.

Uses, etc.—In varnish making.

SUCCINUM.—Amber.—A fossil resin from various species of submerged coniferous trees.

N.O.—Coniferæ.

Habitat.—Shores of the Baltic, etc.

Characters.—In irregular pieces, yellowish and transparent, resembling bright clear resin. It is hard, but brittle, and breaks with a conchoidal fracture, and is devoid of taste and smell. It is partially soluble in alcohol (one-eighth) and in ether (one-tenth). By destructive distillation succinic acid and "oil of amber" (a terpene) result.

Uses, etc.—For the preparation of succinic and "oil of amber." Also largely used in the arts.

Note.—Oil of Amber.—The U.S.P. formerly included a rectified oil of amber (*Oleum succini rectificatum*), prepared by distilling the crude oil with water. The product, a pale yellow or colourless, thin liquid of S.G. ·920, has stimulant and antispasmodic properties.

LACCA.—Lac.—A resinous exudation produced on species of Ficus and other trees by the puncture of an insect—Coccus Lacca.

N.O.—Urticaceœ, etc.

Habitat.—East Indies, etc.

Characters.—Lac is known in three forms, viz. :—

1. *Stick-lac.*—Consisting of thin twigs, encrusted with a brown-red resin, the surface of which is perforated with numerous minute pores. When chewed it colours the saliva red; largely soluble in alcohol.

2. *Seed-lac.*—Consisting of minute, irregular fragments, broken from the twigs, and partially exhausted by water; usually brighter in colour than stick-lac.

3. *Shell-lac.*—Consisting of thin translucent fragments of a reddish-yellow colour, insoluble in water, freely soluble in alcohol. This variety is obtained by removing the colouring matter of the crude stick-lac, by washing with water, melting, and rolling into sheets.

Chemistry :—	Stick-lac.	Seed-lac.	Shellac.
Resin	68 %	88·5 %	90·9 %
Colouring matter	10 %	2·5 %	0·5 %
Wax	6 %	4·5 %	4·0 %
Gluten	5·5 %	2·0 %	2·8 %
Foreign matters and loss	10·5 %	2·5 %	1·8 %

Uses, etc.—Crude lac was formerly occasionally used in medicine; now only for the preparation of varnishes, sealing wax, etc.

Note.—Lac-dye consists of the colouring matter of stick-lac, prepared by allowing the wash-liquor obtained in preparing shell-lac to deposit, the sediment so obtained being pressed into cakes and dried.

Sealing wax.—The best red variety is prepared by mixing together shellac, venice turpentine, balsam of Peru and cinnabar.

DRACONIS RESINA.—Dragon's Blood.—The resin obtained from the fruit of Dæmonorops (Calamus) Draco.

N.O.—Palmaceæ.

Syn.—Sanguis draconis.

Habitat.—Borneo and Sumatra.

Characters.—Occurs in irregular grains, cakes or irregular masses, and in cylindrical sticks, which are about twelve inches long, half an inch or more thick, and are wrapped in palm leaves. It is of a dark red-brown colour on the surface, of a brighter red, glossy, and somewhat porous nature internally, transparent in thin splinters, and breaking with a resinous but irregular fracture. It is soluble in alcohol, amylic alcohol, benzol and chloroform; ether and turpentine dissolve it less freely, and petroleum benzin not at all. Inodorous and nearly tasteless.

Chemistry.—A little fat, a peculiar resin, *draconin* (90 per cent.), which by distillation yields toluol and styrol.

Uses, etc.—As a colouring agent in pharmacy and in the arts.

Note.—The term dragon's blood has also been applied to the resins of DRACŒNA DRACO (Socotra), PTEROCARPUS DRACO (West Indies) and CROTON DRACO.

LABDANUM.—Labdanum.—A resinous exudation from various species of Cistus.

N.O.—Cistaceæ.

Syn.—Ladanum.

Habitat.—Coasts of the Mediterranean.

Characters.—In dark-brown, soft, glutinous masses, or in hard, cylindrical, contorted or spiral pieces. The former variety is the purest, but it is seldom met with; that usually found in commerce being the harder and less pure variety known as a common or roll labdanum.

Chemistry.—Resin, volatile oil, wax, extractive matter, etc.

Uses, etc.—Now obsolete, formerly much prized for its aromatic and stimulant properties.

XANTHORRHŒÆ RESINA.—Xanthorrhœa Resin. The resinous exudation of Xanthorrhœa hastilis and X. arborea.

N.O.—Juncaceæ.

Syn.—Botany Bay Resin, Acaroid Resin.

Habitat.—Australia.

Characters.—In yellowish or brownish-yellow brittle masses; opaque, fusible; odour and taste balsamic; insoluble in water, soluble in alcohol.

Chemistry.—Resin, volatile oil, cinnamic and benzoic acids.

Uses, etc.—Tonic, stimulant. *Dose.*—5-20 grains in tincture.

Note.—Black-boy Gum is the name given to the resin obtained from X. AUSTRALIS. It is a red, balsamic resin, resembling dragon's blood.

4. GUM RESINS.—GUMMI-RESINÆ.

This group of products includes the milky exudations of plants dried by spontaneous evaporation, consisting essentially of mixtures of gum and resin, with frequently also a small percentage of volatile oil. When triturated with water, the insoluble resin becomes held in a suspension by the gum, and a more or less perfect emulsion results.

CAMBOGIA.—Gamboge.—A gum-resin obtained from Garcinia Hanburii (Garcinia Morella, *var.* Pedicellata).

N.O.—Guttiferæ.

Syn.—Gummi gutta, Gutta gamba.

Habitat.—Siam and Cochin China.

Characters and Tests.—In cylindrical hollow or solid rolls, longitudinally striated on the surface, and either distinct or more or less agglutinated or folded together into masses; breaking with a conchoidal fracture: the fractured surface being opaque, smooth, glistening, and of a uniform reddish yellow colour. Powder, bright yellow; no odour; taste, very acrid. When rubbed with water forming a yellow emulsion; it is completely dissolved by the successive aid of rectified spirit and water, and an emulsion made with boiling water, and cooled, does not become green with the solution of iodine. On ignition in air it burns, leaving less than one per cent. of ash.

Note.—The cylindrical variety (*pipe gamboge*) is obtained by running the juice (latex) into the hollow stems of the bamboo-cane, the latter being removed when the gamboge has dried. The drying causes contraction, and, as a result of this, holes are often seen through the middle of the cylinders. Some gamboge of inferior quality (*cake* or *lump gamboge*) is sometimes met with in irregular masses of several pounds weight.

Chemistry.—*Gambogic acid* (the resin) 70 to 75 per cent., and from 20 to 25 per cent. soluble gum. The former is obtained by solution in alcohol and precipitation with water; with alkalies it forms dark red solutions *(gambogiates).* The gum although soluble in water differs from arabin in not being precipitated by solution of subacetate of lead, by ferric chloride or by borax. Gamboge is free from starch and contains little if any fixed inorganic matter. In testing for starch with iodine it should be noted that a green colour would result if this adulterant were present, because a mixture of blue and yellow becomes green.

Uses, etc.—As drastic purgative. *Dose.*—1 to 4 grains. Also a valuable colouring agent.

B.P. Preparation.

Pilula Cambogiæ Composita - - 1 in 6, nearly.

SCAMMONIUM—Scammony.—A gum-resinous exudation obtained by incision from the living root of Convolvulus Scammonia, hardened in the air.

N.O.—Convolvulaceæ.

Habitat.—Asia Minor.

Characters.—As usually found in commerce it is in flattish cakes or pieces of irregular form and of varying sizes, ash-grey or blackish-brown externally, and sometimes sprinkled over with a greyish-white powder. It is very brittle, and when fractured the surface is resinous, shining, more or less porous, and of a uniform dark greyish-black colour; easily triturated into an ash-grey powder, which forms with water a smooth emulsion. Odour peculiar, cheesy; and when chewed causing a slight pricking sensation in the back of the throat. It does not effervesce with hydrochloric acid. A cooled decoction is not rendered blue by solution of iodine. Ether removes about 75 per cent. of resin; and what remains is chiefly soluble gum, with a little moisture.

Note.—The gum-resin is collected in mussel-shells from the roots, the tops of which are cut off obliquely about two inches from the origin of the stems. Each root yields a few drachms. It is but rarely exported in its pure state, being usually mixed with the compressed juice of the stem and leaves, wheat, flour, chalk, or fine sand, etc. It is often bubble-like on the surface, owing to the presence of air cavities, the result of a species of fermentatton. The so-called *virgin* scammony is the best; the *Aleppo* is much adulterated, as is the case with nearly all. The usual adulterations, which extend to 150 per cent., are stones, sand, chalk, starch, gum and gypsum. The amount of ash is a control over the inorganic impurities, for in good products it does not exceed 3 per cent. *Skilip* scammony contains only 30 to 40 per cent. resin, and much wheat starch. The microscopic characters of scammony starch differ from those of wheat starch, hence it is readily detected by the microscope; chalk is detected by the presence of white spots and effervescence with hydrochloric acid; starch is detected by boiling with water, cooling, and adding tincture of iodine, when a blue colour results if present; the presence of extraneous earthy matter is ascertained by estimating the amount of ash. To estimate the amount of resin present, advantage is taken of its solubility in ether. One hundred grains or less are moistened with S.V.R. to coagulate gum, and render it insoluble in any moisture which might be in the solvend or solvent, and are then agitated with ether until nothing is dissolved; subsequent evaporation of the ethereal fluid gives the percentage of resin. A spurious scammony, manufactured in the South of France, and known as *Montpellier scammony*, is a mixture of the juice of some unknown plant with various resins and other substances.

Chemistry.—The official requirements with regard to scammony are that it shall contain 75 per cent. of resin, soluble in ether, the remainder being soluble gum and moisture; specimens containing a lesser percentage are frequently met with. The resin is the glucoside *scammonin* (*see* Scammoniæ Radix) which has been shown to be identical with *jalapin (orizabin)*, the purgative principle of male jalap.

Uses, etc.—Similar to those of Scammony Resin.

B.P. Preparations.

Mistura Scammonii - -	3 grains in 1 fluid ounce.
Resina Scammoniæ.	

EUPHORBIUM.—Euphorbium.—The resin obtained by incisions from the branches of Euphorbia officinarum (resinifera).

N.O.—Euphorbiaceæ.

Habitat.—Morocco and other parts of Western Africa.

Characters.—It occurs in irregularly shaped tears, usually pierced with one or two diverging holes made by the double prickles of the plant on which it has dried. Colour dull yellowish-white. The dust causes irritation of the passages lined with mucus membrane.

Chemistry.—Amorphous resin (38 per cent.), *euphorbon* (22 per cent.), mucilage (18 per cent.), malates of sodium and calcium (12 per cent.), and 10 per cent of other inorganic matter.

Uses, etc.—Internally cathartic and emetic; used externally only as vesicant, etc.

MYRRHA.—Myrrh.—A gum-resinous exudation obtained from the stem of Balsamodendron Myrrha.

N.O.—Burseraceæ.

Habitat.—Arabia Felix and Abyssinia.

Characters.—In roundish or irregular-formed tears or masses of agglutinated tears, varying very much in size; reddish-brown or reddish-yellow externally, dry, and more or less covered by a fine powder; brittle, fractured surface irregular, somewhat translucent, rich brown, oily, and frequently marked with opaque whitish spaces or striæ. Odour agreeable, aromatic, bitter and acrid.

Note.—It has recently been stated that the true source of myrrh is COMMIPHORA ABYSSINICA and also probably C. SCHIMPERI (Arabia and Abyssina). The same authorities also assert that Balsamodendron Myrrha not only yields no gum-resin, but is even quite free from aromatic properties.

Chemistry.—Myrrh contains volatile oil (2·5 per cent.); resin (*myrrhin*), 23 per cent.; gum (50 to 60 per cent.); ash (3·5 per cent.) The gum which is dissolved out by water is partially precipitated by acetate of lead, thus differing from gum arabic. The resin is soluble in chloroform and alcohol, partially soluble in alkalies and bisulphide of carbon. The part of the resin insoluble in bisulphide of carbon is soluble in ether. The insoluble portion remaining from the tincture forms an excellent mucilage with water, and is well suited for common purposes. The volatile oil (*myrrhol*) is pale yellow, thick, and has a variable s.g. 0·98 to 1·015. Tincture of myrrh acquires a purple hue on the addition of nitric acid.

Uses, etc.—Stimulant and tonic. *Dose.*—10-20 grains A frequent ingredient of gargles and liquid dentifrices.

B.P. Preparations.

Decoctum Aloes Compositum -	2·2 grains in 1 fluid oz.
Mistura Ferri Composita - -	6 grains to 1 fluid oz.
Pilula Aloes et Myrrhæ - -	1 part in 6.
,, Asafœtidæ Composita -	1 part in 3½.
,, Rhei Composita - -	1 part in 8, nearly.
Tinctura Myrrhæ - - - -	1 in 8 of rectified spirit.

Note.—Myrrh is occasionally adulterated by admixture with sand, etc., and other gum-resins, and gums are sometimes found in the packages. Bdellium (*q.v.*) has been substituted for it.

BDELLIUM.—Bdellium.—The gum-resinous exudation of (1) Balsamodendron Mukul and (2) Balsamodendron (Heudelotia Africanum.

N.O.—Burseraceæ.

Habitat.—(1) India. (2) Africa.

Characters.—*Indian bdellium* occurs in irregular masses or roundish pieces of a dark-reddish brown colour; more moist than myrrh; of a wax-like fracture, translucent in thin layers; somewhat tenacious, softening with the heat of the hand, and adhereing to the teeth when chewed. Odour feeble, myrrh-like. *African bdellium* is in irregular, roundish, or oval tears; about an inch in diameter, very hard; varying in colour from pale-yellow to brown-red. It is translucent, breaks with a waxy fracture, has but little odour, and a feebly bitter taste.

Chemistry.—Volatile oil, gum-resin, etc.

Uses, etc.—Occasionally in plasters.

Note.—Bissa Bôl (perfumed bdellium) was formerly known in commerce as Indian Myrrh. In appearance it is like an inferior dark-coloured myrrh, having a waxy fracture and possessing an odour which has been likened to that of mushrooms. *Balm of Gilead (Balsamum Gileadense*—Mecca Balsam) is now but rarely met with in commerce. It is said to be obtained near Mecca, from COMMIPHORA OPOBALSAMUM, but not by spontaneous exudation. It is a yellowish or whitish, fragrant, viscid liquid, containing about 30 per cent. of volatile oil and 64 per cent. of hard resin.

OLIBANUM—Olibanum.—A gum-resin obtained from Boswellia Carterii and other species by making incisions into the inner bark of the tree.

N.O.—Burseraceæ.

Syn.—Thus, Frankincense.

Habitat.—Arabia Felix and the Somali country.

Characters.—In the form of round, oblong, or ovate tears, one-eighth to half an inch in diameter, colourless, pale yellow or of a reddish hue, and generally covered with a whitish powder produced by friction; not very brittle, with a dull and waxy fracture; odour balsamic and resinous; taste acrid, bitterish, somewhat aromatic; softens in the mouth; the reddish masses soften in the hand, and burn with a fragrant odour. It is often mixed with fragments of bark and small crystals of calcium carbonate.

Chemistry.—Volatile oil (8 per cent.), resin (50 per cent.), gum (30 per cent.), other matters (5 per cent.) and ash.

Uses, etc.—The frankincense of the ancients. It is used in the preparation of incense, fumigating powders and pastilles.

AMMONIACUM.—Ammoniacum.—A gum-resinous exudation from the stem (after being punctured by beetles) of Dorema Ammoniacum.

N.O.—Umbelliferæ.

Habitat.—Persia and the Punjaub.

Characters.—In roundish tears varying in size from that of a coriander fruit to a cherry, or in nodular masses of agglutinated tears of various sizes and forms; pale yellowish-brown externally when recent, but darkening by keeping to cinnamon brown; milky white and opaque internally; hard and brittle when cold, and breaking with a dull waxy fracture, but readily softening with heat. It has a faint, peculiar, non-alliaceous odour, and a bitter acrid taste. When triturated with water it forms a nearly white emulsion. It is coloured yellow by caustic potash, and a solution of chlorinated soda gives it a bright orange hue.

Chemistry.—An oleo-gum-resin consisting of volatile oil containing little or no sulphur (2 per cent.), resin (70 per cent.), gum (28 per cent.) Ammoniacum is destitute of umbelliferone, but when fused with caustic potash yields a little resorcin (the homologue of orcin).

Uses, etc.—Antispasmodic, stimulant and expectorant. *Dose.*—10-20 grains.

B.P. Preparations.

Emplastrum Ammoniaci cum Hydrargyro - - - -	12 parts in 15.
Emplastrum Galbani - -	1 part in 11.
Mistura Ammoniaci - -	13½ grains to 1 fluid ounce, nearly.
Pilula Scillæ Composita -	1 part in 6¼, nearly.
,, Ipecacuanhæ cum Scilla	1 part in 7.

Note.—African Ammoniacum (FERULA TINGITANA) occurs in large, compact, dark, heavy masses, formed of agglutinated tears of a hard, waxy consistence. The tears are opaque white or of a pale, greenish-yellow, mixed with others of a blackish-brown, which. with vegetable and earthy impurities, constitute a large portion of the mass. The odour is feeble and different from that of the Persian drug. This variety is now seldom met with, but is said to be the Ammoniac of the ancients.

GALBANUM.—Galbanum.—A gum-resin obtained from Ferula galbaniflua, Ferula rubricaulis and probably other species.

N.O.—Umbelliferæ.

Habitat.—Persia.

Characters.—In tears or in masses of agglutinated tears. The tears are roundish or irregular in form, and vary in size from that of a lentil to a hazel nut, although rarely exceeding that of a pea; yellowish-brown, orange-brown, or yellowish-green; more or less translucent, usually rough and dirty on the surface, hard and brittle in cold weather, but softening in the summer, and by the heat of the hand becoming ductile and sticky. The masses, which commonly contain pieces of root, stem, and other impurities, are usually hard, compact, irregular in form, yellowish-brown, dark brownish-yellow, or rarely greenish. The odour is peculiar, aromatic, and not disagreeable; taste bitter, unpleasant and somewhat alliaceous.

Note.—There are two kinds of Galbanum known in commerce, viz., *Levant Galbanum* and *Persian Galbanum*, both, however, coming from or through Persia. Persian Galbanum so-called, is commonly softer than the Levant variety, being sometimes of the consistency of Venice turpentine, and differs also from the latter in the possession of a turpentine-like odour, in addition to the characteristic one of Galbanum. It comes into commerce by way of Russia.

Chemistry.—Volatile oil (7 per cent.), resin (60 to 66 per cent.), gum (about 20 per cent.), impurities (7 to 14 per cent.) The volatile oil, S.G. 0·88 to 0·92, is a colourless liquid, and boils at 175° C. The resin, heated for some time with hydrochloric acid at 100° C., yields 1 per cent. umbelliferone, which can be removed from the acid liquid by ether or chloroform. Fused with caustic potash, galbanum resin yields 6 per cent. resorcin. By dry distillation a fine blue aromatic and bitter oil is obtained.

Uses, etc.—As stimulant and expectorant.

B.P. Preparations.

Emplastrum Galbani - - - - -	1 in 11.
Pilula Galbani Composita - - - -	1 in $3\frac{1}{2}$.

OPOPANAX.—A gum-resinous exudation from the stem (near the root) of Opoponax Chironium.

N.O.—Umbelliferæ.

Habitat.—South Europe.

Characters.—It occurs in irregular-shaped, but usually angular pieces, of a reddish-yellow colour, sometimes speckled white, from the recent exposure of the interior. Odour strong and fœtid; taste bitter and acrid. S.G. 1·62.

Chemistry.—Volatile oil (5·9 per cent.), resin (42 per cent.), and gum (33 per cent.) It forms an emulsion with water.

Uses, etc.—Formerly made use of for purposes similar to those for which the other umbelliferous gum-resins were used; now practically obsolete as a medicine.

ASAFŒTIDA—Asafœtida.—A gum-resin obtained by incision from the living root of Ferula Narthex (Narthex Asafœtida), and of Ferula Scorodosma, and probably other species.

N.O.—Umbelliferæ.

Habitat.—Afghanistan and the Punjaub.

Characters.—Rarely in tears; usually in irregular masses varying in consistence and size, and composed of tears agglutinated together by darker-coloured and softer material. When broken or cut, the exposed surface has an amygdaloid appearance, the fractured tears being opaque and milk-white at first, but changing gradually to purplish-pink or reddish-pink, and finally to dull yellowish-brown. Taste bitter, acrid and alliaceous; odour strong, alliaceous and persistent. When triturated with water it forms a white emulsion. The freshly fractured surface of a tear when touched with nitric acid assumes for a short time a fine green colour. It should yield not more than 10 per cent. of ash; 50 to 60 per cent. should be soluble in rectified spirit.

Note.—Asafœtida comes into British commerce through India, and is largely imported from Bombay. It is very occasionally met with in separate tears, but more commonly in masses of agglutinated tears. Large quantities of *stony assafœtida*, consisting almost entirely of inorganic substance, are also imported.

Uses, etc.—Stimulant, antispasmodic, laxative, etc. *Dose.*—5-20 grains.

B.P. Preparations.

Enema Asafœtidæ - - -	30 grains to 4 fluid ounces.
Pilula Aloes et Asafœtidæ -	1 part in 4.
,, Asafœtidæ Composita	1 part in 3½.
Spiritus Ammoniæ Fœtidus	33 grains to 1 fluid ounce.
Tinctura Asafœtidæ - -	1 in 8 of rectified spirit.

Note.—Sagapenum (*Serapinum*) is or was an oleo-gum-resin of a Persian tree, formerly imported by way of Bombay, but now rarely if ever met with. In appearance it is somewhat similar to asafœtida, but does not appear pink at a new fracture, as is the case with the latter, and the odour is also similar to that of asafœtida, but is less disagreeable. The volatile oil is said to be free from sulphur. In medicinal properties it was regarded as being intermediate between galbanum and asafœtida.

5. OLEO-RESINS.—OLEO-RESINÆ.

THESE are the oleo-resinous juices of plants, containing much resin and varying proportions of volatile oil. In the majority of cases they are obtained by means of incisions made in the trees which yield them, but in some instances they are more or less altered in constitution through the means used in their production. The oleo-resins are usually liquids more or less thick and viscid according to the relative proportions of volatile oil and resin which they contain. By the prolonged use of a gentle heat the volatile oil may be dissipated—a more or less hard and brittle resin usually remaining.

THUS AMERICANUM.—Common Frankincense.—The concrete turpentine which is scraped off the trunks of Pinus australis (Pinus palustris) and Pinus Tæda.

N.O.—Coniferæ.

Syn.—White turpentine.

Habitat.—Southern States of North America.

Characters.—When fresh it is a softish yellow, opaque, tough solid, with the same odour as crude American turpentine, but, by keeping, it becomes dry and brittle, darker in colour, and of a milder odour.

Chemistry.—Volatile oil (oil of turpentine), 14-18 per cent., resin, 82-86 per cent.

Uses, etc.—Externally as a stimulant.

B.P. Preparation.
Emplastrum Picis.

Note.—Thus Americanum (*Terebinthina, U.S.P.*) in its crude state is the source of American turpentine, which constitutes the bulk of the turpentine of British commerce.

TEREBINTHINA CANADENSIS.—

Canada Turpentine.—The turpentine obtained by puncturing or incising the bark of the trunk and branches of Pinus balsamea (Abies balsamea).

N.O.—Coniferæ.

Syn.—Canada Balsam.

Habitat.—Canada.

Characters.—A pale yellow and faintly greenish transparent oleo-resin, of the consistence of thin honey, with a peculiar, agreeable terebinthinate odour, and a slightly bitter, feebly acrid taste; by exposure to the air drying very slowly into a transparent adhesive varnish, and solidifying when mixed with about a sixth of its weight of magnesia.

Chemistry.—Volatile oil ($C_{10}H_{16}$) 18-24 per cent., resin about 75 per cent. One-fifth of the resin is insoluble in boiling alcohol, but soluble in ether, the remainder being soluble in the first-named liquid.

Uses, etc.—In pharmacy for making the preparations mentioned below. Both the oleo-resin and the resin obtained by dissipating the volatile oil, are used in solution in chloroform or some other liquid, for making varnish for mounting microscopic objects, etc. *Dose.*—20-30 grains.

B.P. Preparations.
Charta Epispastica.
Collodium Flexile.

TEREBINTHINA VENETA.—Venice Turpentine.

The crude turpentine obtained by boring to the heartwood of Pinus Larix (Larix Europœa). Collected in the Tyrol: formerly imported from Venice.

N.O.—Coniferæ.

Syn.—Larch turpentine.

Characters.—It is a nearly transparent or slightly opaque and somewhat fluorescent, thick liquid, of a terebinthinate odour, a bitter and aromatic taste, and a yellowish or greenish-yellow colour. It is freely soluble in alcohol, amylic alcohol, acetone and glacial acetic acid, and does not become hard when mixed with magnesia.

Chemistry.—It yields, on distillation, 15 per cent. of essential oil of the formula $C_{10}H_{16}$, consisting chiefly of *pinene*, the remainder being resin similar to colophony.

Uses, etc.—Obsolete as a medicine.

Note.—Adulterations.—A fictitious variety, made by melting together rosin and turpentine, has chiefly, if not entirely, replaced the genuine drug. True Venice turpentine may be distinguished by the length of time required to dissipate the volatile oil when a thin layer is painted upon paper and exposed to the atmosphere.

TEREBINTHINA EUROPŒA.—Bordeaux Turpentine.

The turpentine obtained in various parts of Europe from various species of Pinus—as P. sylvestris, P. laricio, P. pinaster (P. maritima), etc.

N.O.—Coniferæ.

Syn.—Terebinthina Vulgaris, Galipot, etc.

Habitat.—Russia, Finland, Austria, South of France, etc.

Characters.—Viscid, honey-like, yellowish, somewhat opaque, becoming transparent by exposure to the air; odour agreeable, taste warm and bitterish. When long kept in bottle, separating into two layers, the upper clear and somewhat fluorescent, the lower granular, through the presence of numerous crystals of abietic acid.

Chemistry.—Similar to that of Thus, *q.v.*

Uses, etc.—As a stimulant, etc., in plasters.

Note.—The oil of turpentine, distilled from European pines, is little met with in England, our supply being almost entirely from America. French oil of turpentine (from P. maritima) differs from the American (English) and Russian oils in being strongly lævo-rotatory.

TEREBINTHINA CHIA.—Chian Turpentine.—

An oleo-resinous exudation from the stems (after incision) of Pistacia Terebinthus.

N.O.—Anacardiaceæ.

Habitat.—Islands of Scio, Cyprus and others of the Grecian Archipelago.

Characters.—When fresh it is a transparent liquid, of honey-like consistence, but possessing more tenacity; colour greenish-yellow or yellowish-brown, with little taste, and mild, agreeable, terebinthinate odour. As obtained in commerce, it is a soft solid, becoming a brittle. It is entirely soluble in alcohol and ether.

Chemistry.—Resin and volatile oil (14 to 15 per cent.) The latter is isomeric with oil of turpentine and has a S.G. of 0·869 and a boiling point of 161·1° C.

Uses, etc.—Recommended in the treatment of cancer. *Dose.*—5-10 grains in emulsion or pills.

ELEMI.—Manila Elemi.—

A concrete resinous exudation, the botanical source of which is undetermined, but is sometimes referred to Canarium commune.

N.O.—Burseraceæ.

Habitat.—Manila (Phillipine Islands).

Characters.—When fresh, soft, granular, resinous and colourless, but by keeping it becomes harder, and of a pale yellow tint. Odour strong and fragrant, somewhat resembling fennel and lemon. Moistened with rectified spirit, it breaks up into small particles, which, when examined by the microscope, are seen partly to consist of acicular crystals.

Chemistry.—Essential oil, $C_{10}H_{16}$ (10 to 12 per cent.), a resin *(amyrin)*, amorphous resin, *bryoidin*, *elemic acid*, and bitter extractive.

Uses, etc.—As stimulant for external use.

B.P. Preparation.

Unguentum Elemi - - - - 1 in 5.

Note.—OTHER ELEMIS.—*Mexican Elemi, Vera Cruz Elemi*, has now disappeared from commerce; it was a yellow or whitish, brittle resin obtained in Mexico from AMYRIS ELEMIFERA.

Brazilian Elemi, the produce of various species of ICICA, has been obtained from Pernambuco; it is a greenish-yellow terebinthinous resin.

Mauritius Elemi, from COLOPHONIA MAURITIANA, is like Manila elemi in appearance and composition.

Luban Meyeti, an exudation of BOSWELLIA FREREANA, obtained near Cape Gardafui, is said by Fluckiger to be the Oriental or African Elemi of the olden writers.

Australian Elemi, an exudation obtained in Queensland from CANARIUM MUELLERI, has recently been described. It is said to be neither identical with, nor allied to, Manila Elemi.

COPAIBA—Copaiva or Copaiba.—The oleo-resin obtained by cutting deeply or boring into the trunk of Copaifera Langsdorffii and other species of Copaifera.

N.O.—Leguminosæ.

Syn.—Balsam Copaiba, Capivi, etc.

Habitat.—Valley of the Amazon.

Characters and Tests.—A more or less viscid liquid; generally transparent and not fluorescent, but some varieties are opalescent and occasionally slightly fluorescent; light yellow to pale golden brown, having a peculiar aromatic odour, and a persistent acrid, somewhat bitter taste. Its specific gravity varies from 0·940 to 0·993. A small quantity heated until all volatile oil is removed yields a residue which, when cold, is hard, and generally easily rubbed to powder, and the oil volatilised during the operation does not smell of turpentine. Almost entirely soluble in absolute alcohol, and in four times its bulk of petroleum spirit, the latter solution only yielding a filmy deposit on standing.

Allied species, etc.—The drug is exported from Para and Marantam, in Brazil, and also from Maracaibo, Carthagena, Rio Janeiro, Angostura, etc., and the different commercial varieties receive their names from these places. Species other than C. Langsdorffii yielding the drug are C. OFFICINALIS, C. CORIACEA, C. GUIANENSIS, C. MULTIJUGA, etc. The incisions may be made wedge-shaped (the pieces afterwards replaced) or by means of an augur. Sometimes old trees burst from the internal pressure exerted by the liquid. The flow is often so rapid as to yield ten to twelve pounds in a few hours.

Chemistry.—Volatile oil (40 to 60 per cent.) of s. g. 0·890 to 0·910, the remainder consisting of resins. The resin is hard, brittle, translucent, greenish-brown, and consists largely of *copaivic acid* ($C_{20}H_{30}O_2$), *oxycopaivic acid*, from Para copaiba, and *meta-copaivic acid*, from Maracaibo copaiba. Copaivic acid forms crystallizable salts with alkalies, and is hence frequently prescribed in the form of a soap with potash.

Uses, etc.—Stimulant, diuretic, laxative, and, in large doses, purgative; employed mostly in the treatment of gonorrhœa. *Dose.*—20 to 60 minims.

B.P. Preparation.

Oleum Copaibæ - - - yield, 40 to 60 per cent.

Preparations other than B.P.—Resin of copaiba preparing by distilling off essential oil with steam; solidified copaiba (*Massa Copaibæ, U.S.P.*), a tincture of copaiba with magnesia.

Oleum Copaibæ, B.P., oil of copaiba, is a colourless or pale-yellow oil with the taste of copaiba. It has s. g. 0·890 to 0·910, is lævo-rotatory, has a neutral reaction, is soluble in its own volume of absolute alcohol, and boils between 245° and 260° C. It consists of a hydrocarbon, $C_{20}H_{32}$, which, with hydrochloric acid gas, gives a crystalline hydrochlorate. *Dose.*—5 to 20 minims.

Adulterations of Copaiba.—Gurgun balsam, unlike copaiba, thickens and solidifies when heated, and its admixture with the latter may be detected by agitating one part of copaiba with nineteen parts of carbon disulphide and one part of a mixture of nitric and sulphuric acids. If Gurjun be present a purple or violet colour is produced. If castor oil or any other fixed oil be present, the residue left on driving off the volatile oil is soft and sticky. Turpentine oil may be detected by its odour when the drug is distilled with steam. As a general test of purity the solubility of copaiba in Petroleum spirit should be noted, viz., one part in four or less.

Note.—African Copaibas.—Two oleo-resins from Africa, in many respects similar to South American copaiba, have recently been described; in therapeutic value, however, they are said to be inferior. An examination of the plant Copaifera Salikounda, growing in W. Africa, the seeds of which are used medicinally by the natives, has shown it to be very similar botanically to C. Langsdorffii, and it is thus regarded as a link between the American and African species.

DIPTEROCARPI OLEO-RESINA.—Dipterocarpus Oleo-Resin.—An oleo-resin obtained from the trunk of Dipterocarpus turbinatus.

N.O.—Dipterocarpaceæ.

Syn.—Gurjun, Gurgun Balsam, Wood Oil.

Habitat.—India.

Characters.—It is a transparent liquid, s. g. 0·964 (about), of a dark-brown sherry colour, slightly fluorescent, and consequently presenting a greenish opalescence on the surface. It has the consistence of olive oil with an odour and taste resembling Copaiba, but less powerful. By heating to 132·2° C. it becomes turbid and gelatinous, and does not form a clear solution with benzol.

Chemistry.—A volatile oil of the terpene series (40 per cent.) and a resin known as *gurgunic acid.*

Uses, etc.—As Copaiba, for which it has been substituted, and for adulterating which it was formerly used. *Dose.*—30-60 minims.

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6. EMPYREUMATIC OILS.—OLEA EMPYREUMATICA.

These are complex liquids of an oleo-resinous nature, obtained by the destructive distillation of various organic substances, such as wood, bones, etc.

PIX LIQUIDA.—Tar.—A bituminous liquid, obtained from the wood of Pinus sylvestris, and other species of Pinus, by destructive distillation.

N.O.—Coniferæ.

Syn.—Wood tar.

Habitat.—Arctic Europe and Asia.

Characters—A dark-brown or blackish semi-liquid substance, of a well-known peculiar aromatic odour. Water agitated with it acquires a pale-brown colour, a sharp empyreumatic taste and acid reaction.

Note.—The wood yields between 7 and 8 per cent. of tar. There are three kinds :—*Stockholm* or *Archangel tar*, *American tar*, and a tar obtained as a bye-product in the manufacture of crude acetic acid and gunpowder charcoal. The first is the best for medicinal use. The decomposition of wood by heat commences at 160° C.; amongst the products are—(*a*) Gaseous.—Carbonic anhydride, carbonic oxide, hydrogen and steam. (*b*) Liquor.—Acetic acid, wood spirit (naphtha) methyl acetate, acetone, in conjunction with water, in which they are all soluble. The remainder is empyreumatic oil, insoluble in water. (*c*) Solid.—A black resin (pitch) which, when wood tar is distilled, remains behind in the retort. This was formerly used in medicine under the name of *Pix nigra* or *Pix navalis*. Many of these products contain much oxygen, their composition thus differing greatly from that of the substances obtained by the distillation of coal.

Chemistry.—*(See* note *above.)* The empyreumatic oil is of a highly complex character, and contains hydrocarbons such as *toleune*, *xylene*, *mesitylene*, etc., phenols such as *phenol*, *cresol guaiacol*, *creosol*, *phlorol*, *methyl-creosol*, etc. In addition to these there are present paraffin, naphthalene, pyrene and pyrocatechin.

Uses, etc.—Stimulant, antiseptic ; used externally in skin diseases. *Dose.*—20-60 minims. It yields up a small proportion of its constituents to water, producing *tar water*. Creosote *(see below)* is obtained from wood tar.

B.P. Preparation.

Unguentum Picis Liquidæ.

Note.—The U.S.P. includes a syrup of tar, and non-official alcoholic solutions and paints, etc., for external use are prepared.

Creasotum, B.P., is a liquid obtained by the distillation of wood tar. It consists chiefly of guaiacol and creosol—some varieties containing more of the former, others more of the latter. It has s. g. 1·071, does not coagulate albumen, and gives a green to red and brown colour with ferric chloride (distinction from phenol).

OLEUM CADINUM.—Oil of Cade.—An empyreumatic oily liquid obtained by the destructive distillation of the woody portions of Juniperus Oxycedrus and some other species.

N.O.—Coniferæ.

Syn.—Huile de Cade : Juniper Tar Oil.

Habitat.—Europe.

Characters.—A dark reddish-brown or nearly black, more or less viscid, oily liquid, with a not unpleasant empyreumatic odour and an aromatic, bitter and acrid taste ; s. g. about ·990. It is soluble in ether and chloroform ; partially soluble in cold, almost wholly in hot rectified spirit. In water it is very slightly soluble. The filtered aqueous solution is almost colourless, and possesses an acid reaction.

Chemistry.—Similar to that of wood tar.

Uses, etc.—As external stimulant in skin diseases.

Note.—*Oleum Rusci* (*Oleum Betulæ Albæ, Birch tar*) is a bituminous liquid obtained by the destructive distillation of the wood of Betula alba. It has a peculiar odour which it imparts to Russian leather. Its activity as a medicine is due to the presence of guaiacol and cresol and it contains also much pyrocatechin. It is used in skin diseases.

OLEUM ANIMALE EMPYREUMATICUM.

Empyreumatic Animal Oil.—An empyreumatic oil obtained by the destructive distillation of bones and other animal substances, purified by redistillation.

Syn.—Animal oil, bone oil, Dippel's oil.

Characters.—The purified oil is a yellowish, thin oil liquid of s. g, about 0·800. It has a characteristic penetrating odour and a pungent, acrid and bitter taste. It has a faintly alkaline reaction, and is readily soluble in alcohol, ether and oils. On exposure to the air it becomes darker in colour and thicker in consistence.

Chemistry.—Highly complex. Contains *pyrrol, pyridine, picoline, lutidine, collidine,* etc., in addition to methyl, ethyl and propyl-amines.

Uses, etc.—Formerly given in typhus, epilepsy and other diseases, also as an external stimulant. Pyridine is recommended in asthma and allied complaints.

7. BALSAMS.—BALSAMA.

The term balsam was formerly applied indiscriminately to oleo-resinous substances generally, but it is now customary to include under that head those aromatic resins and oleo-resins only, which contain cinnamic or benzoic acid or both.

BALSAMUM TOLUTANUM.—Balsam of Tolu.

Tolu.—A balsam which exudes from the trunk of Myroxylon Toluifera after incisions have been made in the bark.

N.O.—Leguminosæ.

Syn.—Myroxylon (Myrospermum) Tolutana, Toluifera Balsamum.

Habitat.—Venezuela and New Granada.

Characters.—When first imported it is a soft and tenacious solid, but it becomes harder by keeping, and then, in cold weather, is brittle, like resin. In thin films it is transparent and of a yellowish-brown colour, and when pressed between pieces of glass with the aid of heat, and then examined with a lens, it exhibits an abundance of crystals of cinnamic acid. Odour highly fragrant, especially when warmed; taste somewhat aromatic and slightly acid. It is soluble in rectified spirit, and the solution has an acid reaction.

Note.—Mode of Collection.—Two sloping notches are cut through the bark, meeting at their lower ends in an acute angle, below which the bark and wood are hollowed out a little to receive the calabash cup into which the balsam flows. Many of these V-shaped cuts are made on the same tree. The contents of the cups are put into flask-shaped bags made of raw hide, a pair of them being slung over the back of a donkey. These bags are transferred to depôts on the Magdalena river, when the contents are received into cylindrical tins.

Chemistry.—Amorphous resin (similar to that found in Peru balsam), *cinnamic acid* (12 per cent.), *tolene* (volatile oil, 1 to 2 per cent.), *benzyl benzoate* and *benzyl cinnamate.* Tolu balsam is freely soluble in chloroform, glacial acetic acid, acetone, ether, alcohol and liquor potassæ; scarcely soluble in petroleum-benzine, benzol and carbon bisulphide.

Uses, etc.—Stimulant, expectorant, etc. *Dose.*—10-20 grains.

B.B. Preparations.

Pilula Phosphori - - - -	4 parts in 9.
Syrupus Tolutanus - - -	$1\frac{1}{4}$ oz. to 3 pounds.
Tinctura Benzoini Composita -	11 grains to 1 fluid oz.
*Tinctura Tolutana - - -	1 in 8 of rectified spirit.

**Contained in* Trochisci Acidi Tannici, Morphinæ, Morphinæ et Ipecacuanhæ, Opii.

Adulterations.—Turpentines may be detected by the odour on distillation with steam and by their ready solubility in carbon bisulphide. Styrax and other adulterants may be detected by treating the carbon bisulphide extracts with sulphuric acid; in the absence of impurities the balsam gives a cherry-red, in their presence a dark-brown colour.

BALSAMUM PERUVIANUM.—Balsam of Peru.—A balsam exuded from the trunk of Myroxylon Pereiræ, after the bark has been beaten, scorched, and removed.

N.O.—Leguminosæ.

Syn.—Toluifera Pereira, Myrospermum Pereira.

Habitat.—Central America.

Characters.—A liquid somewhat less viscid than treacle, appearing nearly black in bulk, but in thin layers deep orange-brown or reddish-brown and transparent. Its odour is agreeably balsamic, more especially when heated, and when swallowed it leaves a disagreeable burning sensation in the throat. It is insoluble in water, but soluble in chloroform or rectified spirit. Specific gravity between 1·137 and 1·150. Ten drops triturated with six grains of slaked lime produces a permanently soft mixture, and the mixture, on being warmed until all volatile matter is given off, and until charring commences, gives no fatty odour. It should not diminish in volume when shaken with an equal bulk of water.

Note.—MODE OF PRODUCTION.—The bark is first beaten with mallets and then scorched, which causes it to separate, rags being placed between wood and bark, and these are afterwards boiled in water, the balsam sinking to the bottom of the vessel, and after removal of water it is placed in gourds or metallic drums. This constitutes *balsamo-negro*. The semi-solid substance, known as *balsamo-blanco*, or white balsam, is obtained by expression from the seeds and inner portion of the fruit of the same tree. It has been confounded with Tolu, but the odour is marked and quite distinct.

Chemistry.—The mode of preparation adopted causes chemical changes in this balsam, and at the same time gives it a darker colour; naturally it should be much like Tolu balsam. It contains amorphous resin, 32-38 per cent., *benzyl benzoate*, *benzyl cinnamate (cinnamëin)*, *cinnamyl cinnamate (styracin)*, together with free *cinnamic and benzoic acids* and traces of *styrol*, *stilbene*, *vanillin*, etc.

Uses, etc.—As stimulant, expectorant, etc. *Dose.*—10 to 15 minims. Used also externally in the form of an ointment.

Adulterations.—Spirit; oils insoluble in spirit; copaiba oleo-resin. *Copabia* is detected by distilling and adding iodine to the distillate—if present, an explosion occurs. *Castor Oil* is detected by adding sulphuric acid and subsequently water; a brittle resin results if pure, if soft, then oil may be present. *Alcohol* is best detected by distillation and applying Lieben's test (viz., the production of iodoform) to the distillate

Note.—The term Peruvian is a misnomer acquired through the balsam having been always shipped at Peruvian ports.

STYRAX PRÆPARATUS.—Prepared Storax.

Storax.—A balsam prepared from the inner bark of Liquidambar orientalis. Purified by solution in alcohol, filtration and evaporation.

N.O.—Hamamelideæ.

Syn.—Styrax liquidus.

Habitat.—Greece, Asia Minor and Syria.

Characters.—A semi-transparent brownish-yellow semi-fluid balsam about the consistence of thick honey, with a strong agreeable odour and balsamic taste. Heated in a test-tube on the vapour bath, it becomes more liquid but gives off no moisture; boiled with solution of bichromate of potassium and sulphuric acid it evolves an odour resembling that of essential oil of bitter almonds.

Note.—The wood of the plant is called in Cyprus *Xylon Effendi*, and the bark is known as *Cortex Thymiamatis* or *Storax Bark.* To obtain the balsam the inner bark of the tree is boiled in water, by which means the balsam is separated. It is then packed in horse-hair bags and strongly pressed in a wooden press; hot water being thrown on the bags, and pressure renewed as long as any balsam can be obtained. Thus obtained it is taken to Smyrna and shipped chiefly to Trieste.

Chemistry.—*Styrol*, *cinnamene* or *cinnamol*, C_8H_8 (a volatile, odorous liquid); *cinnamic acid* and the cinnamic ethers of *cinnamyl*, *phenylpropyl* and *ethyl; storesin;* resin; water and other impurities, 20-30 per cent.

Uses, etc.—As stimulant and expectorant.

B.P. Preparation.

Tinctura Benzoini Composita.

ALLIED BALSAMS.—*Solid storax (true storax)*, now no longer obtainable, was derived from the stem of S. OFFICINALIS (*N.O.*—Styraceæ). An artificial solid storax *(Styrax Calamita)* is prepared artifically in the Levant by mixing sawdust with liquid stryrax, and other mixtures, prepared in various ways, are found in commerce under the same name. *Sweet Gum* is obtained in N. and S. America by spontaneous exudation from LIQUIDAMBAR STRYRACIFLUA (*N.O.*—Hamamelideæ). It is described as a thick, brownish-yellow, clear, aromatic liquid, solidifying in the cold. It contains an odorous hydrocarbon, and in other respects much resembles liquid storax. Aromatic resins are also obtained in China from LIQUIDAMBAR FORMOSANA and in Java and Burmah from ALTINGIA EXCELSA (LIQUIDAMBAR ALTINGIANA).

8. VOLATILE OILS.—OLEA VOLATILIA.

Volatile or essential oils are liquids, vaporisable without decomposition, possessing characteristic odours and capable of imparting a temporary translucent stain to paper. Most essential oils are lighter than water—the specific gravity usually being between 0·850 and 0·950. They are usually soluble in 95 per cent. alcohol, in ether, in fixed oils, but only very slightly so in water. By a reduction in temperature many volatile oils may be divided into two portions—a liquid so-called elœ͡optene and a solid crystalline *stearoptene* or *camphor*—the latter constituent usually differing from the former in containing oxygen.

Methods of Extraction, etc.—Volatile oils occur in various parts of the plants which yield them; thus they are found in dermal glands of capitate and peltate form, *e.g.*, Thymus, Humulus; in short cavities, *e.g.*, Rutaceæ (orange, etc.): in tube-like structures, *e.g.*, vittæ of Umbelliferæ; in passages, *e.g.*, Coniferæ, Umbelliferæ, Anacardiaceæ, etc., when they are generally associated with resins. For the extraction of essential oils the methods adopted are various, it being necessary to take into consideration not only the nature of the drug to be operated upon, but also the constitution of the oil to be obtained. Thus, in the case of many delicate flavouring essences and others used in perfumery, care must be taken to preserve the delicate aromas which belong to these essences. In some few cases (mustard, almond, etc.) the oils do not pre-exist in the plant, but are the result of chemical action brought about by the process of manufacture. The following are some of the processes adopted in obtaining essential oils:—

(a.) *Distillation.*—This is best conducted in a steam-jacketed still, having a false wooden bottom. The drug is placed in the still and covered with water, the oil passing over with water being separated from it by means of a Florentine receiver or some other kind of separator· In some cases salt is added to the water in the still in order to raise the boiling point.

(b.) *Passage of Steam through the Drug.*—This process is very similar to the first, the steam being supplied by a pipe entering the still at such a point as to permit the complete saturation of the drug with water vapour. Here again the Florentine receiver may be used, and the last portions of water are removed from the oil by means of calcium chloride or some similar water-absorbing salt.

(c.) *Cold Expression.*—In using this method, which is adopted chiefly in the case of fruits such as oranges, lemons, etc., the oil vesicles are ruptured either by squeezing, pricking or grating, and the exuding oil is collected and purified by filtering, etc. In Sicily, for obtaining oil of lemon, etc., the *sponge process* is largely made use of. This consists in cutting the rind into strips—squeezing the strips in order to rupture the vesicles, and absorbing the oil by means of sponges held in the workman's hand. In the South of France the *écuelle à piquer* is chiefly made use of for obtaining these oils. This consists of a funnel-like vessel having at its centre a number of stout pins, by means of which the peel is pierced and the oil which runs through into the tube of the funnel may be collected below. The method of *grating* is very similar, and is sometimes adopted in obtaining oil of Bergamot. The residuary rind from any or all of these processes contains a certain amount of oil which the means used do not liberate, and this is sometimes removed either by hydraulic pressure of the mass in horsehair bags or by distillation with water, the product in this case being, however, much inferior in aroma to the oil obtained by cold expression.

(d.) *Enfleurage.*—This is the process employed at Grasse and other places for obtaining the perfume of flowers (*e.g.*, jasmin, etc.) It consists in placing the flowers on sheets of glass smeared with lard or some other fat. The latter, which acts as a solvent, after a time becomes impregnated with the odour of the flowers. A similar result may be obtained by macerating the flowers in melted fat.

(e.) *Solution.*—In some cases essential oils may be removed by treating the drug with solvents—such as light petroleum, ether, etc. The solvents are subsequently removed by gentle evaporation, and the oil may, if necessary and desirable, be distilled with water to purify it.

General Chemical Characters of Volatile Oils.—Though frequently highly complex bodies, volatile oils are usually made up of one, two, or more chief constituents. The chemical nature of these varies considerably—the following being the compounds most frequently met with :—

(a.) *Terpenes* ($C_{10}H_{16}$).—These constitute the bulk of a large number of volatile oils. They are so-called from oil of turpentine, which is the type of the true terpenes. There are several varieties of terpene, including the *lævo-pinene* of French oil of turpentine, etc., the *dextro-pinene* of English (American) oil of turpentine, oils of wormwood, green-mint, nutmeg, and the *pinene* of oils of sage, juniper, rosemary, fir-wool, etc. Other terpenes are the solid *camphene*, obtained from pinene hydrochloride, *phellandrene*, contained in some varieties of eucalyptus oil, *dextro-limonene* (*citrene, carvene, hesperidene*), contained in oils of lemon, dill, orange, cumin, etc., and *dipentene* (*cinene, inactive limonene*), contained in camphor oil, oils of cascarilla and fennel.

In addition to the terpenes several other hydrocarbons nearly allied to them are found in ethereal oils, *e.g.*, *cymene* ($C_{10}H_{14}$), occurring in oils of cumin, thyme and ajowan, *sesquiterpenes* ($C_{15}H_{24}$), found in oils of cedar, savine, etc., *diterpenes* ($C_{20}H_{32}$), the chief constituents of resin oil, *polyterpenes* ($(C_{10}H_{16})n$). occurring in caoutchouc and *hemiterpenes* (C_5H_8), of which isoprene is an example.

(b.) *Aldehydes.*—The oils of bitter almonds (*benzoic aldehyde*), of cinnamon, cassia, etc. (*cinnamic aldehyde*), of rue (*several aldehydes*), vanillin (*methyl-protocatechuic aldehyde*), belong to this class of bodies.

(c.) *Ketones.*—Of this class *camphor*—the camphor-like bodies found in oils of lavender, rosemary, sage, etc., and *carvol* are the most important members.

(d.) *Alcohols.—Menthol* and *borneol* (Borneo-camphor) belong to this class.

(e.) *Phenol derivatives.—Thymol* (from oil of thyme, etc.), *carvacrol* (from oil of origanum, cumin, etc.), *eugenol* (from oil of clove, pimento, etc.), *safrol* (in oil of sassafras, etc.) and *eucalyptol* (from oil of eucalyptus, cajuput, etc.) are included under this head.

(f.) *Esters.*—The most important esters or ethereal salts found in essential oils are *methyl salicylate* (wintergreen oil) and *allyl sulphocyanide* (mustard oil). In addition to these there are others less important, *e.g.*, *ethyl benzoate* (found in oil of ylang-ylang), etc.

Isolation of Constituents of Essential Oil.—In addition to the generally useful method of fractional distillation other means of isolating the constitutent parts of essential oils may be adopted. It may be brought about by producing the reaction peculiar to the class of bodies to which the constituents belong: *e.g.*, hydrocarbons (terpenes, etc.) may be separated by forming crystalline halogen derivatives; aldehydes and ketones by means of the crystalline compounds formed when these bodies are acted upon by alkaline bisulphites; alcohols (menthol, etc.) by fractional crystallization; phenols and ethereal salts by saponification.

Adulteration.—The adulterants most commonly made use of for sophisticating essential oils are alcohols, oil of turpentine and fixed oils. Alcohol may be detected by adding fuchsine or tannin to the oil, when, if spirit be present, these substances are dissolved. Oil of turpentine may often be detected by its odour, or in an oil free from terpene by adding iodine when, if adulterated, heating or even explosion will take place. Fatty oils may be detected by leaving a greasy stain on paper, by their non-solubility in alcohol, or their odour, and, when other saponifiable bodies are absent, by treatment with caustic alkali. The presence of water in an essential oil may be detected by adding to it a few chips of dried calcic chloride—these rapidly lose their angularity if water be present.

The following official volatile oils are described under the plants, etc., which yield them :—

Oleum	Anethi	*see*	Anethi Fructus.
,,	Anisi	,,	Anisi Fructus and Anisi Stellati Fructus.
,,	Anthemidis	,,	Anthemidis Flores.
,,	Caryophylli	,,	Caryophylli Fructus.
,,	Cinnamomi	,,	Cinnamomi Cortex.
,,	Copaibæ	,,	Copaiba.
,,	Coriandri	,,	Coriandri Fructus.
,,	Cubebæ	,,	Cubebæ Fructus.
,,	Limonis	,,	Limonis Fructus.
,,	Pimentæ	,,	Pimentæ Fructus.
,,	Sabinæ	,,	Sabinæ Cacumina.
,,	Sinapis	,,	Sinapis Semina.

OLEUM CAJUPUTI.—Oil of Cajuput.—

The oil distilled from the leaves of Melaleuca minor (Melaleuca Cajuputi).

N.O.—Myrtaceæ.

Habitat.—Batavia and Singapore.

Characters.—Transparent, limpid, very volatile, pale bluish-green liquid; odour strong, agreeable and camphoraceous; taste warm, bitterish, aromatic, camphoraceous, succeeded by a sensation of coldness in the mouth.

Chemistry, etc.—S.G. 0·920 to 0·927. The chief constituent of the oil is *cajuputol (cineol, eucalyptol)* $C_{10}H_{18}O$, which, by distillation with phosphorus pentoxide, gives *cajuputene.* $C_{10}H_{16}$. The oil is wholly soluble in alcohol. It has been found to contain traces of copper which give it a permanent green tint, but its natural green colour is probably due to a chlorophyll-like compound. Cajuputol may be detected and estimated by the same tests as are applied to oil of eucalyptus, *q.v.*

Uses, etc.—Internally as powerful stimulant and diaphoretic. *Dose.*—1-4 minims. Externally as liniment in rheumatism, etc.

B.P. Preparations.

Linimentum Crotonis - -	3½ in 8.
Spiritus Cajuputi - - -	1 in 50 of rectified spirit.

Note.—The U.S.P. gives M. LEUCADENDRON as the source of the oil, and possibly M. minor is a variety of that species. Oils similar to that of Cajuput are obtained from other species of Melaleuca, *e.g.*, M. HYPERICIFOLIA, M. VIRIDIFOLIA, M. LATIFOLIA, etc.

OLEUM EUCALYPTI.—Oil of Eucalyptus.

The oil distilled from the fresh leaves of Eucalyptus Globulus, Eucalyptus Amygdalina and probably other species of Eucalyptus.

N.O.—Myrtaceæ.

Habitat.—Australia, Tasmania, etc.

Characters and Tests.—Colourless or pale straw-coloured, becoming darker and thicker by exposure. It has an aromatic odour and a spicy, pungent flavour, leaving a sensation of coolness in the mouth. It is neutral to litmus paper and has specific gravity about 0·900. Soluble in about an equal weight of alcohol.

Chemistry, etc.—The oils obtained from the different varieties of Eucalyptus differ considerably in constitution and physical properties, albeit the official statement of character and tests covers most of them. The globulus oil has s. g. 0·910 to 0·930, is usually slightly dextro-rotatory, consists of *eucalyptol* (*cineol*), $C_{10}H_{18}O$, the terpenes, *limonenene* and *pinene*, *cymene* and traces of aldehydes. The amygdalina oil has s. g. from 0·860 to 0·890, is lævo-rotatory and consists of *phellandrene*, $C_{10}H_{16}$, with other hydrocarbons and little or no eucalyptol. Phellandrene may be separated from the oil by dissolving it in glacial acetic acid and adding sodium nitrate when an insoluble *nitrosite* is precipitated.

Eucalyptol (cineol), $C_{10}H_{18}O$, is obtainable from the globulus and certain other Eucalyptus oils by treatment with syrupy phosphoric acid, an insoluble *eucalyptol phosphate* which water resolves into its components, being formed. It may also be obtained fairly pure by fractional distillation.—(B.P. 176° C.) It has s. g. 0·926, is optically inactive, and solidifies at 2° C. It is regarded by some authorities as the therapeutically important constituent of eucalyptus oil, and the eucalyptol content of the oil is, therefore, sometimes taken as a standard of quality.

Uses, etc.—As antiseptic and deodorizer; recently much used as a preventive in epidemic influenza. *Dose.*—1-4 minims.

B.P. Preparation.

Unguentum Eucalypti - - - 1 in 5.

Note.—Besides the two species of Eucalyptus mentioned in the B.P. the oils of several others are met with in commerce: *e.g.*, oils of E. DUMOSA (*malee scrub*), E. CNEORIFOLIA (cumin-like in odour), E. OLEOSA, all of which are rich in eucalyptol and E. MACULATA, var. CITRIODORA E. UNCINATA, E. GRACILIS, E. INCRASSATA, E. ODOROTA, the first named of which contains *citronellic aldehyde*.

OLEUM LAVANDULÆ.—Oil of Lavender.

The oil distilled in Britain from the flowers of Lavandula vera.

N.O.—Labiatæ.

Habitat.—Britain.

Characters.—Pale yellow or nearly colourless, with the very fragrant odour of the flowers, and a hot, bitter aromatic taste. It reddens litmus paper and is readily soluble in alcohol and in glacial acetic acid.

Chemistry, etc.—S.G. 0·880 to 0·895, becoming denser on keeping. Lævo-rotatory; soluble in all proportions of rectified spirit and in three parts of 70 per cent. alcohol. Formerly regarded as containing a camphor and several terpenes, it is now stated to consist of *linalool acetate* (found also in bergamot oil), *linalool* and other alcohols.

Uses, etc.—As aromatic stimulant and carminative, usually in conjunction with other medicines. *Dose.*—1-4 minims.

B.P. Preparations.

Linimentum Camphoræ Compositum, 60 minims in 1 pint.
Spiritus Lavandulæ - - - - 1 volume in 50.
Tinctura Lavandulæ Composita - 45 minims in 1 pint.

Adulterations.—The English oil (B.P.) is not infrequently adulterated with continental oil of L. vera and with that of *spike lavender* (L. SPICA). These adulterants are not capable of ready detection chemically. Oil of spike lavender is, however, dextro-rotatory, and contains little or no linalool acetate.

OLEUM RUTÆ.—Oil of Rue.

—The oil distilled from the fresh herb of Ruta graveolens, a native of Southern Europe, but common also in gardens in this country.

N.O.—Rutaceæ.

Habitat.—Southern Europe.

Characters.—Colour pale-yellow when recent, odour strong and disagreeable and having a bitter, acrid taste.

Chemistry, etc.—S.G. 0·835 to 0·840; slightly dextro-rotatory. Consists of a mixture of aldehydes and ketones, chiefly methyl-nonyl-ketone, $CH_3.CO.C_9H_{19}$, and, consequently, should be converted into a solid crystalline mass when treated with a hot solution of sodium bisulphite.

Uses, etc.—As stimulant and antispasmodic. *Dose.*—1-4 minims. Also externally as rubefacient.

OLEUM JUNIPERI.—Oil of Juniper.—The oil distilled in Britain from the full-grown unripe green fruit of Juniperus communis.

N.O.—Coniferæ.

Habitat.—Britain.

Characters.—Colourless or pale greenish-yellow, with the characteristic odour of the fruit and a warm aromatic taste.

Chemistry, etc.—S.G. 0·865 to 0·880. Lævo-rotatory; soluble in an equal volume of absolute alcohol. Consists of *pinene* ($C_{10}H_{16}$), *cadinene* ($C_{15}H_{24}$) and other poly-terpenes, with probably small quantities of esters.

Uses, etc.—As stimulant, carminative and diuretic. *Dose.*—1-4 minims.

B.P. Preparation.

Spiritus Juniperi - - - - - - 1 in 50.

Note.—The specific gravity and probably also the chemical character of this oil vary both with the degree of maturity of the berries from which it is distilled and with the age of the oil after distillation. The riper the berries, and the longer the time of keeping the oil, the denser does it become.

OLEUM PINI SYLVESTRIS.—Fir-Wool Oil.—The oil distilled from the fresh leaves of Pinus sylvestris.

N.O.—Coniferæ.

Characters and Tests.—Colourless, or nearly so, with an aromatic lavender-like odour and a pungent but not unpleasant taste. S. G. not below 0·870. Soluble in about seven times its volume of rectified spirit.

Note.—The specific gravities of commercial samples of this oil vary from 0·860 to 0·910, and oils obtained from the source given by the B.P. are said to have s. g. always above 0·880. The title *fir-wool oil* is registered, and the preparation sold under this name has s. g. generally below 0·870.

Chemistry, etc.—Dextro-pinene, sylvestrene, sesquiterpene and *bornyl acetate.* Good samples should contain not less than five per cent. of the last-named constituent.

Uses, etc.—Externally as rubefacient, also in form of inhalation.

B.P. Preparation.

Vapor Olei Pini Sylvestris.

Note.—Oleum Pini Pumilionis is the oil obtained from the leaves of the "mountain pine," PINUS PUMILIO, and sold under the name of "Pinol," "Pumiline," etc. In most respects the oil is similar to true oil of Pinus sylvestris, but it contains a larger percentage of esters.

OLEUM ROSMARINI.—Oil of Rosemary. The oil distilled from the flowering tops of Rosmarinus officinalis.

N.O.—Labiatæ.

Characters.—Colourless or pale-yellow, with the odour of rosemary, and a warm, aromatic taste.

Chemistry, etc.—S.G. 0·900 to 0·915. Dextro-rotatory; about one-fifth should distil over above 200° C., and the oil should be soluble in half its volume of rectified spirit. It contains *pinene*, *cineol* and *borneol* (about 15 per cent.), the latter constituent being the most important.

Uses, etc.—Stimulant, but rarely given internally. *Dose.*—1-4 minims. Used externally as rubefacient.

B.P. Preparations.

Linimentum Saponis - - -	1 fluid drachm in 7 fluid ounces, nearly.
Spiritus Rosmarini - - -	1 volume in 50.
Tinctura Lavandulæ Composita	5 minims in 1 pint.

Note.—Adulteration with oil of turpentine may be detected by insolubility in twice its volume of rectified spirit, and by the low borneol percentage given on esterification by treatment with acetic anhydride.

OLEUM SANTALI.—Oil of Sandal-Wood.

The oil distilled from the wood of Santalum album.

N.O.—Santalaceæ.

Syn.—Oleum Santali Flavi.

Habitat.—Indigenous to Southern India and some of the East Indian Islands.

Characters and Tests.—Thick in consistence, pale-yellow in colour, of a strongly aromatic odour, a pungent and spicy flavour, and neutral or slightly acid in reaction. Its s. g. is usually about 0·96. It is readily soluble in alcohol.

Note.—The s. g. given by the B.P. is too low—that of oils distilled from E. Indian wood ranging from about 0·975 to 0·985—some of the imported oils having a still greater density.

Chemistry, etc.—The oil dissolves in five or six parts by volume of 70 per cent. alcohol at 20° C.; it is lævo-rotatory (about—16°) and does not begin to distil before 270° C. It contains two little-understood oxygenated bodies, *santalal* ($C_{15}H_{24}O$) and *santalol* ($C_{15}H_{26}O$).

Uses, etc.—In gonorrhœa, etc. *Dose.*—10-30 minims, usually given in capsules or emulsions.

Note.—*Cedar wood oil* has s. g. about 0·940 and does not answer the spirit solubility test given above. Australian and W. Indian santal oils are somewhat less dense than the official oil, and are dextro-rotatory.

OLEUM TEREBINTHINÆ.—Oil of Turpentine.

—The oil distilled, usually by aid of steam, from the oleo-resin (turpentine) obtained from Pinus australis (Pinus palustris), Pinus Tæda, and sometimes from Pinus Pinaster and Pinus sylvestris; rectified if necessary.

N.O.—Coniferæ.

Syn.—Spirit of Turpentine.

Habitat.—America.

Characters.—Limpid, colourless, with a strong peculiar odour, which varies in the different kinds, and a pungent and bitterish taste. It commences to boil at 320° F. (160° C.) and almost entirely distils below 356° F. (180° C.), little or no residue remaining.

Chemistry, etc.—S.G. 0·855 to 0·870. Soluble in three times its volume of alcohol and in an equal volume of glacial acetic acid. The commercial oil commonly contains resin or other oxygenated compounds, but the pure distillate consists of terpenes ($C_{10}H_{16}$) only, viz., *dextro-pinene* in the case of English or American oil *(australene)*, *lævo-pinene* in that of French oil *(terebenthine)*, from P. maritima. Swedish turpentine oil contains pinene and *sylvestrene*, while the Russian product (from P. sylvestris) contains these bodies with *dipentene* in addition.

Note.—The bulk of the oil of turpentine used in this country comes from America (Carolina, etc.), the annual export from the U.S. exceeding at the present time thirteen million gallons.

Uses, etc.—As antiseptic, stimulant, diuretic, etc. *Dose.*—10 minims to 4 fluid drachms.

B.P. Preparations.

Confectio Terebinthinæ - - -	1 in 4.
Enema Terebinthinæ - - - -	1 to 15.
Linimentum Terebinthinæ - - -	1 in 1$\frac{1}{4}$.
Linimentum Terebinthinæ Aceticum	1 in 2, nearly.
Unguentum Terebinthinæ - - -	1 in 2 $\frac{1}{8}$.

Note.—TURPENTINE OIL DERIVATIVES.—When heated to 250°-300° C. *pinene* (oil of turpentine) is converted into *dipentene* ($C_{10}H_{16}$) and *meta-terebenthene* ($C_{20}H_{32}$). When treated with a small percentage of gradually added sulphuric acid turpentine oil is converted into a mixture of *terebene* ($C_{10}H_{16}$), *cymene* ($C_{10}H_{14}$) and *colophene* ($C_{20}H_{32}$. By distilling this mixture with steam, terebene may be obtained fairly pure. Terebene is officially inactive, of s. g. about ·864, and is given in bronchial complaints. *Artificial camphor* (pinene hydrochloride, $C_{10}H_{16}$,HCl) is obtained by conducting HCl gas into well cooled pinene; it is a crystalline, camphor-like body melting at 125° C. By the action of nitric acid in the presence of alcohol and water, turpentine oil is converted into *terpin-hydrate* ($C_{10}H_{20}O_2$,H_2O), an odourless, crystalline substance soluble in hot water. When heated above 100° C. terpin-hydrate loses water and becomes converted into *terpine*, $C_{10}H_{18}(OH)_2$, which crystallizes in needles. By treatment with sulphuric acid terpin-hydrate becomes converted into *terpineol*, $C_{10}H_{17}HO$,—a thick, optically inactive liquid. *Camphene*, $C_{10}H_{16}$, is a solid terpene obtained by the elimination of the haloid acid from pinene hydrochloride. The preparation known as "sanitas" is obtained by blowing air through Russian turpentine oil.

OLEUM ROSÆ.—Oil of Rose.—The volatile oil distilled from the fresh petals of cultivated varieties of Rosa Damascena.

N.O.—Rosaceæ.

Syn.—Attar of Rose. Otto of Rose.

Habitat.—Bulgaria and other parts of S. Europe.

Characters.—A pale-yellowish, transparent liquid, having the strong, fragrant odour of rose, and a mild, slightly sweetish taste, s. g. 0·860 to 0·875 at 20° C. It is but slightly soluble in alcohol and should be neutral to litmus paper moistened with alcohol. Melting point 16° to 22° C.

Chemistry, etc.—Oil of rose consists of a mixture of a liquid oxygenated portion and a solid hydrocarbon, $C_{16}H_{34}$, belonging to the paraffin series. The liquid portion, which has been called *rhodinol* ($C_{10}H_{18}O$) and also *roseol* ($C_{10}H_{20}O$), was formerly thought to be identical with *geraniol* (from pelargonium and andropogon oils); it is now, however, looked upon as distinct from that body. The proportion of solid hydrocarbon (stearoptene) present, varies from 9 to 18 per cent. and the value of the oil is inversely proportional to this percentage.

Uses, etc.—In perfumery.

Adulteration.—The U.S.P. includes a test for detecting the presence of the *oils of rose-geranium* from Pelargonium species (*N.O.*—Geraniaceæ), and of *oil of ginger-grass* (Turkish oil of Geranium), from Andropogon schœnanthus, etc. (*N.O.*—Gramineæ.) Spermaceti and paraffin are also said to be used as adulterants.

OLEUM MENTHÆ PIPERITÆ.—Oil of Peppermint.

—The oil distilled in Britain from fresh flowering peppermint, Mentha piperita.

N.O.—Labiatæ.

Habitat.—Britain (Mitcham, etc.)

Characters.—Colourless, pale-yellow or greenish-yellow when recent, but becoming gradually thicker and reddish by age, with the odour of peppermint and a strong, penetrating, aromatic taste, followed by a sensation of coldness in the mouth.

Chemistry, etc.—S.G. 0·900 to 0·910. Lævorotatory 20° to 30° in 100 m-m tube; at least 50 per cent. should distil above 200° C. and below 220° C. The oil should solidify on the addition of a menthol crystal when cooled by the temperature of a mixture of ice and salt, and should be soluble in an equal volume of rectified spirit. Oil of peppermint contains several bodies including *menthol* ($C_{10}H_{20}O$) and small quantities of a *menthol ester* and of *menthone* ($C_{10}H_{18}O$). The most important constituent is menthol or *peppermint camphor*, a solid alcohol possessing the characteristic odour and taste of the oil. A chemical method of determining the percentage of menthol is based upon the formation of menthol-acetate when the oil is treated with acetic anhydride, the ester being subsequently decomposed and the resulting acetic acid determined. The total menthol content of Mitcham oil is from 55 to 70 per cent.

Uses, etc.—Internally as aromatic, stimulant and carminative. *Dose.*—1-4 minims. Externally in tic and allied complaints.

B.P. Preparations.

Aqua Menthæ Piperitæ -	1 in 850, about.
Essentia Menthæ Piperitæ -	1 in 5 of rectified spirit.
Pilula Rhei Composita -	1 min. in 60 grains, nearly.
Spiritus Menthæ Piperitæ -	1 in 50 of rectified spirit.
Tinctura Chloroformi et Morphinæ - - -	1 min. in 2 fluid ounces.

Note.—VARIETIES OF PEPPERMINT OIL.—*American Oil of Peppermint* is distilled from M. PIPERITA and has a somewhat higher average s. g. than the English oil (*i.e.*, .900-.920); the percentage of menthol present is usually smaller and the aroma inferior. *Japanese oil of peppermint* is distilled from M. ARVENSIS var. piperascenes, the s. g. is generally low—.900 to .910—and the menthol content high, being sometimes as much as 70 per cent. It is, however, inferior in aroma and taste to the English oil. Partially or wholly deprived of menthol (dementholized) peppermint oil, under the name of *menthene*, is sometimes sold, and is also used as an adulterant.

Adulterations.—The U.S P. includes tests for the detection of oils of camphor and sassafras, which are said to be sometimes used as adulterants, as also are oils of spearmint and of turpentine.

MENTHOL.—Menthol.—A stearoptene obtained by cooling the oil distilled from the fresh herb of Mentha arvensis vars. piperascens et glabrata and of Mentha piperita.

N.O.—Labiatæ.

Syn.—Mentha camphor.

Habitat.—Imported from Japan and China.

Characters and Tests.—In colourless acicular crystals, usually more or less moist from adhering oil; or in fused crystalline masses. Its melting point should not exceed 110° F. (43·3° C.) The hardest masses do not melt below 108° F. (42·2° C.) It has the odour and flavour of peppermint, producing warmth on the tongue, or, if air be inhaled, a sensation of coolness. It is sparingly soluble in water and readily soluble in rectified spirit, the solutions having a neutral reaction. Boiled with sulphuric acid diluted with half its volume of water, menthol acquires an indigo-blue or ultramarine colour, the acid becoming brown. It should entirely be dissipated by the heat of a water-bath.

Note.—Menthol is obtained almost exclusively from the Japanese oil which is distilled from the two varieties of M. arvensis; it is obtained by placing the oil in wooden refrigerators and using the artificial cold of ice and salt if found to be necessary. A yield of 20 per cent. of menthol only alters the gravity of the oil $\frac{1}{1000}$ of its original density

Chemistry, etc.—Menthol, $C_{10}H_{19}OH$, belongs to the class of camphors and chemically is oxyhexahydro-cymene possessing the characters of an alcohol. It is lævo-rotatory, forms esters with acids and readily parts with water. With concentrated hydrochloric acid it forms a liquid *menthol chloride*, $C_{10}H_{19}Cl$, and when distilled with P_2O_5 gives *menthene*, $C_{10}H_{19}$, by the oxidation of which menthone, $C_{10}H_{18}O$, is formed.

Uses, etc.—As local application in neuralgia, etc., much used in the form of cones, pencils, etc. When given internally, *dose*—$\frac{1}{2}$-2 grains.

B.P. Preparation.

Emplastrum Menthol.

CAMPHORA.—Camphor.—A stearoptene obtained from the wood of Cinnamomum Camphora (Camphora officinarum). Imported in the crude state and purified by sublimation.

N.O.—Lauraceæ.

Habitat.—China.

Characters.—In solid, colourless, translucent, crystalline masses, which present numerous fissures when of any size; somewhat tough, but readily powdered if moistened with rectified spirit, ether or chloroform; it has a powerful penetrating odour, and a pungent, somewhat bitter taste, followed by a sensation of cold. It floats on water, burns readily with a bright smoky flame, volatilises somewhat rapidly even at ordinary temperatures, and sublimes entirely when heated ; it is very slightly soluble in water, but readily soluble in rectified spirit, ether, or chloroform.

Method of Production, etc.—Camphor is diffused through all parts of the tree, and is removed from the root, trunk and branches by cutting these into chips and boiling them in water ; the camphor which separates is then sublimed into inverted copper baisins. This constitutes crude camphor as obtained in the Isle of Formosa (off the east coast of China). Another method consists in covering the vessel with a perforated board, and over each hole luting an inverted earthen vessel. Dutch or Japan camphor is exported from Japan and Batavia ; it is obtained by subliming into small earthen pots. It occurs in larger grains than the Formosa variety, is cleaner, and sublimes at a lower temperature. It comes to us in tubs, and from it exudes a reddish-brown oil, which is known as *oil of camphor*. The crude camphor is purified in England by mixing with lime and subliming in thin glass vessels called "bumboles," forming the familiar rings or bells of commerce. It is also sublimed in square bricks or tablet-like pieces of various sizes and thickness, giving a very beautiful product. It also occurs in commerce in powder, when it is known as *camphor flowers*.

Chemistry, etc.—S.G. 0·986 to 0·996, soluble in 700 parts of water, melts at 175° C., boils at 204° C. and is wholly volatile at ordinary temperatures. It forms liquid compounds when mixed with phenol, chloral, thymol, etc. Chemically it is known as *laurinol*, $C_{10}H_{16}O$, and is a keto-derivative of Borneo camphor, $C_{10}H_{18}O$ *(borneol)*. By treatment with phosphorus pentoxide it is converted into cymene, and on boiling with iodine yields carvacrol ($C_{10}H_{14}O$). On oxidation with nitric acid, *camphoric* and *camphoronic* acids are obtained. It may be produced artifically by oxidising the solid terpene camphene. (*See* Oleum Terebinthinæ.)

Uses, etc.—As stimulant, antispasmodic and diaphoretic ; in large doses sedative. *Dose.*—1-10 grains.

B.P. Preparations.

Aqua Camphoræ.	
Linimentum Aconiti - - -	14½ grs. in 1 fluid oz.
,, Belladonnæ - -	14½ grs. in 1 fluid oz.
,, Camphoræ - - -	1 in 5, nearly.
,, ,, Compositum	54½ grs. in 1 fluid oz.
,, Chloroformi - -	1 in 10.
,, Hydrargyri - - -	1 in 15.
,, Opii - - - - -	1 in 10, nearly.
,, Saponis - - -	1 in 21.
,, Sinapis Compositum	1 in 16.
,, Terebinthinæ - -	1 in 20.
,, ,, Aceticum	1 in 11.
Spiritus Camphoræ - - - - -	1 in 10.
Tinctura Camphoræ Composita -	1½ gr. in 1 fluid oz.
Unguentum Hydrargyri Compositum	1½ oz. in 13½ ozs.

Preparations other than B.P.—Creta c. Camphora (as dentifrice prepared in various strengths), Essence of Camphor, 1 in 20 of rectified spirit, Rubini's Essence of Camphor (a saturated solution in rectified spirit), *camphoid*, a substitute for collodium, prepared by dissolving pyroxylin in camphor and alcohol.

Note.—Borneo Camphor, Sumatra Camphor (*borneol*) $C_{10}H_{18}O$, is found in fissures of the tree DRYOBALANOPS CAMPHORA, indigenous to Sumatra and Borneo. Borneo camphor differs from ordinary camphor in having a higher s.g. (1·009), being less volatile and having a distinctive odour. It is highly prized by the Chinese, by whom it is used for embalming purposes. Borneol, which is regarded as an oxyderivative of cymol, may be converted into ordinary camphor by treatment with nitric acid.

Ngai or blumea Camphor has the composition of Borneo camphor, and is obtained from BLUMEA BALSAMIFERA (*N.O.*—Compositæ). *Habitat.*—Tropical Eastern Asia.

Artificial Camphor is obtained by passing hydrochloric acid gas into oil of turpentine.

Oil of Camphor.—Japanese oil of Camphor is the oil obtained in the preparation of crude camphor and in refining it. It is dark-yellow in colour, has a camphoraceous odour and s. g. about 0·940. It contains camphor, part of which it may be made to deposit by lowering the temperature, and there are also present *safrol*, *eugenol*, a *sesquiterpene* and *terpinol*.

Oil of Dryobalanops Camphor, found in the young trees of that species, is a viscid reddish-yellow oil, consisting of a hydrocarbon borneene ($C_{10}H_{16}$) holding resin and borneol in solution.

Camphora Monobromata, U.S.P., $C_{10}H_{15}Br.$, is prepared by heating bromide of camphor in a sealed tube. It is obtained in prismatic scales or needles, having a camphoraceous odour and taste, insoluble in water, soluble in alcohol, ether and chloroform. Used as a sedative and hypnotic.

THYMOL.—Thymol.—A stearoptene obtained from the volatile oil of Thymus vulgaris (*N.O.*—Labiatæ), Monarda punctata (*N.O.*—Labiatæ) and Carum Ajowan (*N.O.*—Umbelliferæ), by saponifying with caustic soda and treating the separated soap with hydrochloric acid, or from a distilled fraction of the oil by exposure at a low temperature. It may be purified by recrystallization.

Characters and Tests.—Large, oblique prismatic crystals having the odour of thyme and a pungent, aromatic flavour. They sink in cold water, but on heating the mixture to a temperature of 43·3° to 51·7° C. they melt and rise to the surface. Slightly soluble in cold water, freely soluble in alcohol, ether and solutions of alkalies. The crystals volatilise completely at the temperature of a water bath. A solution of thymol in half its bulk of glacial acetic acid, warmed with an equal volume of sulphuric acid, assumes a reddish violet colour.

Chemistry, etc.—Thymol ($C_{10}H_{14}O$) chemically is known as a *methyl-propyl phenol*, and may be artificially prepared from nitrocuminaldehyde. By treatment with caustic potash and iodine it yields iodo-thymol.

Uses, etc.—As deodorant, etc. *Dose.*—$\frac{1}{2}$-2 grains. Is a highly powerful disinfectant.

Note.—Annidalin is the fancy name given to iodothymol; it has been offered as a substitute for iodoform.

OLEUM CITRONELLÆ.—Citronelle Oil.—The volatile oil obtained by distillation from the fresh plant Andropogon (Cymbopogon) Nardus.

N.O.—Gramineæ.

Habitat.—Madras Peninsula and Ceylon.

Characters, Chemistry, etc.—Of a yellowish green colour, characteristic odour and pungent taste. S.G. 0·887 to 0·890; soluble in 10 parts of 80 per cent. alcohol. It contains a *terpene* ($C_{10}H_{16}$), *citronellol* ($C_{10}H_{18}O$), and a small quantity of an aldehyde ($C_7H_{14}O$). When treated with sodium bisulphite it yields crystals.

Uses, etc.—In perfumery, soap making, etc.

OLEUM VERBENÆ.—Lemon-grass Oil.—The volatile oil obtained by distillation from the fresh plant Andropogon (Cymbopogon) Citratum and other species of Andropogon.

N.O.—Gramineæ.

Habitat.—India and Ceylon.

Characters, Chemistry, etc.—Of a pale sherry colour, transparent, extremely pungent in taste, and having a peculiar fragrant, lemon-like odour. In constitution it is probably similar to oil of citronelle; it yields a crystalline compound when treated with bisulphite of soda.

Uses, etc.—In India as stimulant and carminative. *Dose.*—3-6 minims; also externally as rubefacient. In this country in perfumery only.

Note.—Oil of Ginger-grass (*Oil of Geranium*) is obtained from A. SCHŒNANTHUS, in India, where it is known as oil of rosé. It is imported into Turkey where it is used for adulterating otto of rose. *Oil of Vitivert* (*oil of Khus-Khus*) is obtained from the root of A. MURICATUS. It has a peculiar pungent odour, and is used in perfumery, as also is the root from which it is obtained.

OLEUM PATCHOULI.—Oil of Patchouli.—The volatile oil obtained by distillation from the leaves of Pogostemon Patchouli.

N.O.—Labiatæ.

Habitat.—Silhet, the Malay Peninsula. Cultivated at Singapore, etc.

Characters, Chemistry, etc.—Thick, brownish-yellow, with a green tint. S.G. 0·955; boiling at 257° C. It contains a stearoptene (*patchouli camphor*) and *cærulein* found also in oil of wormwood and other oils. Is said to be adulterated with cubeb and cedar oils.

Uses, etc.—In perfumery.

9. FIXED OILS, FATS AND WAXES.—OLEA FIXA, Etc.

UNDER this head are included a number of substances derived from both plants and animals, possessing certain common physical and chemical characters. The term *fixed oil* or *fatty oil* is applied to such members of the class as are liquid at ordinary temperatures, while such as are solid under similar conditions rank as *fats*. The *waxes* are solids and chemically are somewhat different from the fats and oils.

General Physical Characters of Oils and Fats.—The colour is usually a golden yellow, but oils both lighter (castor oil) and darker (hempseed oil) in colour are not uncommon. Fixed oils and fats are non-volatile without decomposition, not infrequently possess a distinctive odour due to their origin, and are invariably greasy to the touch and produce a permanent translucent stain on paper when brought into contact with it. The specific gravity is always less than that of water—varying between 0·850 and 0·910. They are insoluble in water, slightly so in alcohol, readily soluble in ether, chloroform, benzol, carbon bisulphide, light petroleum and volatile oils. On exposure to the atmosphere for a lengthened period fixed oils decompose to some extent, becoming acid to litmus paper, and acquiring a peculiar and unpleasant odour and taste. This condition is known as *rancidity*, and is due to presence of free fat acids, the formation of which is considerably hastened by the presence in the oils of water and other impurities. The action of the ferments which produce rancidity is found to be retarded by the addition of certain substances of which benzoin is the most commonly used. In the case of linseed oil and some others there takes place, upon exposure to air, an absorption of oxygen, resulting in the formation of a hard substance, which in thin layers forms a film. Such oils are, on account of this property, known as *drying oils*. In the case of waxes the specific gravity is usually somewhat less than of fats and oils, and their relationship to solvents is also somewhat different.

Method of Production of Fixed Oils.—In extracting vegetable oils it is customary to crush the substance and afterwards to subject it to hydraulic pressure, with or without the application of heat. Oils obtained without heat (cold-drawn) are usually more limpid and contain less solid fatty constituents than those procured at higher temperatures. Fixed oils may also be extracted by means of solvents (light petroleum, etc.), and by this method a complete exhaustion of the vegetable tissues results. In dealing with animal oils, heat alone is usually sufficient to remove the oil from the part containing it. Boiling with water is also adopted, and putrefaction of the containing tissues is a factor also made use of for setting free the oil.

General Chemical Properties of Fixed Oils and Fats.—All the fixed oils and fats of vegetable and animal origin are *esters* (*ethers*) of certain acids which, owing to their origin, are known as *fatty acids*. The majority of them are *triglycerides*, and the acids with which they are most commonly combined are those known as *oleic*, *stearic* and *palmitic*. Thus, olive oil consists largely of *triolein*, which is *trioleate of glyceryl*, whilst suet contains much stearin which is *tristearate of glyceryl*. Olein (triolein) may be looked upon as the trihydric alcohol glycerine, in which three of the hydrogen atoms of the molecule have been replaced with three atoms of the oleic radicle, thus :—

$$C_3H_5\left\{\begin{array}{l}OH\\OH\\OH\end{array}\right. \qquad C_3H_5\left\{\begin{array}{l}O.C_{18}H_{33}O\\O.C_{18}H_{33}O\\O.C_{18}H_{33}O\end{array}\right.$$

GLYCERINE. OLEIN.

In the cases of some few fats the molecule contains only two atoms of acid radicle, while amongst the waxes (spermaceti) and certain oils with which they are associated (sperm oil), the alcohol radicle is not glyceryl, but that of some higher member of the same series. All the fats are decomposed by boiling alkali with the formation of an alcohol and a salt of the alkali used—the latter being known as a *soap*. Thus, olein when treated with caustic soda yields glycerine (glycyl alcohol) and soap (oleate of sodium). A similar result is obtained when a fat is treated with superheated steam, except that, instead of a soap being produced, the fatty acid is set free. The process of treatment of a fat with alkali is known as *saponification*, and the estimation of the amount of alkali required to decompose a given quantity of a fat (*saponification equivalent*) is one of the methods of detection and estimation made use of in the analysis of such bodies. Other methods adopted are treatment with bromine and iodine with which fats of the olein order combine in various proportions, and treatment with sulphuric acid, which causes varying rises of temperature. In addition to these, colour-tests depending upon the hues given with sulphuric and nitric acids, etc., are made use of, as also is treatment with nitrous acid which converts olein into a solid yellow substance known as *elaidin*.

When fats are decomposed by heat they yield vapours of *acrolein*, a strong-smelling volatile compound resulting from the decomposition of glycerine.

Adulteration.—The adulteration of oils, fats and waxes is very common, and, in detecting the substances used for this purpose, advantage is taken of the known chemical properties of the oils. The taking of the specific gravity, saponification equivalent, iodine absorption figure, melting-point of fat acids, and, in a few cases, estimation of the amount of volatile fat acids obtainable, give useful data for ascertaining the presence of adulterants.

The following official fixed oils are described under the plants, etc., which yield them:—Oleum Amygdalæ, *see* Amygdala Amara.
,, Lini, *see* Lini Semina.
,, Myristicæ Expressum, *see* Myristica.

OLEUM OLIVÆ.—Olive Oil.—The oil expressed from the dry ripe fruit of Olea Europœa.

N.O.—Oleaceæ.

Habitat.—Asia and S. Europe ; cultivated.

Characters.—Pale yellow or greenish-yellow, with a very faint agreeable odour and a bland oleaginous taste ; congeals partially at about 36° F. (2°·2 C.)

Note.—The purest oil, "virgin oil," is that obtained by moderate pressure of the fruit. A second quality is got from a further pressure of the "cake," either with or without previous treatment with hot water. The last portions of oil may be removed by treatment of the mass with solvents, *e.g.*, carbon bisulphide. An inferior quality is obtained by pressing fruit which has been previously allowed to ferment. The finest oils are imported from Leghorn, and those from Provence and Tuscany are highly esteemed. That sold in "Florence flasks" has no longer the high reputation which it once enjoyed. The olives of the shops are the unripe fruits collected when green and preserved in salt and water after being first soaked in a weak alkaline solution. When ripe they are purple and, if squeezed gently, immediately after they are gathered, a very pure oil is obtained, of a greenish tint, which does not become rancid, this being the "virgin" oil of commerce.

Chemistry.—S.G. 0·915 to 0·918 at 15° C. At 10° C. it becomes separated into two layers, an upper liquid and a lower granular portion ; the former consists of *triolein* (70 per cent.), the latter chiefly of *tripalmitin*. In addition to these bodies there are present traces of *stearic* and *arachidic* esters, and there is usually a small percentage of free *oleic acid*. On saponification triolein, which is trioleate of glyceryl, yields oleate of the alkali used and glycerin. The other fatty esters may be decomposed on similar lines.

Uses, etc.—As nutritive and demulcent ; has slight laxative action. *Dose.*—½-1 fluid ounce.

B.P. Preparations.

Charta Epispastica.
Emplastrum Ammoniaci cum Hydrargyro.
,, Hydrargyri.
,, Picis.
,, Plumbi.
,, Saponis Fuscum.
Enema Magnesii Sulphatis.
Linimentum Ammoniæ.
,, Calcis.
,, Camphoræ.
Sapo Durus.
Sapo Mollis.
Unguentum Cantharidis.
,, Hydrargyri Compositum.
,, Hydrargyri Nitratis.
,, Veratrinæ.

Note.—The ammonia and lime liniments of the Pharmacopœia are soaps consisting chiefly of oleate of ammonium and calcium respectively.

Adulteration of Olive Oil.—This is extensively practised. Cotton-seed, poppy-seed, sesame and rape oils being amongst the adulterants made use of. The U.S.P. gives the following tests for the purity of olive oil :—

Sparingly soluble in alcohol, readily soluble in ether, chloroform and carbon bisulphide.

If 10 c.c. of the oil be shaken frequently during two hours with a freshly-prepared solution of one gramme of mercury in 3 c.c. of nitric acid, a perfectly solid mass of a pale straw colour will be obtained. [This is due to the formation of *elaidin* (glyceride of elaidic acid), which is a yellow, solid substance produced by the action of nitrous acid on olein. If the proportion of olein in an oil be small, that of elaidin obtainable will be equally so, with the result that, on the application of the above test, a more or less liquid mixture will be obtained.]

If 5 c.c. of the oil be thoroughly shaken in a test-tube with 5 c.c. of an alcoholic solution of silver nitrate (prepared by dissolving 0·1 gramme of silver nitrate in 10 c.c. of alcohol and adding two drops of nitric acid) and the mixture be heated for about five minutes on a water-bath, the oil should retain its original pale yellow colour, not becoming reddish or brown, nor should any dark colour be produced at the line of contact of the two liquids (absence of more than about 5 per cent. of *cotton seed oil* and of many *other foreign oils*). [This is known as Conroy's test.]

If 30 c.c. of the oil be saponified by heating with 20 c.c. of alcohol and 5 grammes caustic potash, the liquid then diluted to 200 c.c. with water and freed from alcohol by boiling, on supersaturating the solution with dilute sulphuric acid the fatty acids will form a layer on the surface. If these be separated as far as possible from water and filtered, 5 c.c. of the clear filtrate when shaken in a test-tube with 5 c.c. of concentrated hydrochloric acid should not colour the latter green ; and, on the subsequent addition of about 0·5 grammes of sugar, and again shaking the mixture, no violet or crimson tint should be produced in the acid layer within 15 minutes (absence of *sessamum oils*).

OLEIC ACID, ACID OLEICUM, B.P., $C_{17}H_{33}COOH$, is described as a fluid fatty acid obtained by the saponification of olein or by the action of superheated steam on fats, with subsequent separation from solid fats by pressure. Usually not quite pure. It is a straw-coloured liquid, nearly odourless and tasteless, and with not more than a very faint acid reaction ; unduly exposed to air it becomes brown and decidedly acid. S.G. 0·860 to 0·890 (or 0·897). It is used in preparing Oleatum Hydrargyri, Oleatum Zinci, and Unguentum Zinci Oleati.

OLEUM CROTONIS.—Croton Oil.—The oil expressed in Britain from the seeds of Croton Tiglium.

N.O.—Euphorbiaceæ.

Syn.—Oleum Tiglii.

Habitat.—India.

Characters.—Brownish-yellow to dark reddish-brown, fluorescent, with a viscid consistence which is increased by age ; a faint, peculiar, somewhat rancid, disagreeable odour, and an oily acrid taste. Entirely soluble in alcohol and turpentine.

Note.—A freshly-expressed oil is soluble in 60 parts of alcohol, and the solubility increases by age through the increase of free acid present.

Method of Production.—The oil is obtained either by compressing the decorticated seeds, by decoction in water, or by treatment with solvents. For internal use a neutral oil obtained by first treating the seeds with alcohol to remove free crotonoleic acid, and subsequently exhausting with petroleum ether is recommended.

Chemistry, etc.—S.G. 0·940 to 0·960 at 15° C. ; freely soluble in ether, chloroform, fixed and volatile oils, etc. The oil contains the glycerine esters of *stearic*, *palmitic*, *myristic*, *lauric* and *oleic acids*, and of also *formic*, *acetic*, *isobutyric* and *isovaleric acids.* There are also present *tiglic acid* (isomeric with angelic acid) and *crotonoleic acid*, which is soluble in alcohol and has a vesicating action, and is, therefore, regarded as the vesicating principle. The purgative action is variously stated to be due to the last-named acid, and to belong to the other constituents. "*Crotonol* has been found only by the discoverer."

Uses, etc.—Internally one of the most powerful purgatives known. *Dose.*—$\frac{1}{3}$-1 min. Externally as stimulant and counter-irritant.

B.P. Preparation.

Linimentum Crotonis, 1 in 8 of rectified spirit, with Oil of Cajuput.

OLEUM RICINI.—Castor Oil.—The fixed oil expressed from the seeds of Ricinus communis.

N.O.—Euphorbiaceæ.

Syn.—Oleum Palmæ Christi.

Characters.—Viscid, colourless, or pale straw-yellow, having scarcely any odour, and a mild taste at first, but subsequently acrid and unpleasant. Entirely soluble in one volume of absolute alcohol and in four volumes of rectified spirit.

MODE OF PREPARATION.—(a.) *Italian.*—Obtained by removing the seed-integuments, crushing and subjecting to powerful hydraulic pressure in rooms heated in winter to about 20° C. The removal of the oil from the seed is facilitated by placing plates, warmed from 32° to 38° C., between the press bags.

(b.) *East Indian.*—The seeds are boiled with water and the oil skimmed off and strained through flannel into tins. They are also subjected to pressure by hydraulic machines, and the oil is afterwards purified in a very imperfect way by heating with water.

(c,) *American.*—Obtained by expression with heat, the oil is allowed to settle, and finally decanted.

Of these three varieties the Italian is the best—the East Indian the poorest. The former owes its freedom from acridity and unpleasant taste partly to the removal of the seed-coats before pressing, and partly to the low temperature used during the manufacture.

Chemistry, etc.—S.G. at 60° F. 0·960 to 0·964. It is soluble in all proportions of alcohol, ether and glacial acetic acid, and is insoluble in petroleum spirit, thus, as well as its high density, differing from the majority of fixed oils. It consists of *ricinolein*, $C_3H_5(C_{18}H_{34}O_3)_3$, and solid fat which is a mixture of *palmitin*, *stearin* and *myristin*. By treatment with nitric acid, ricinolein yields a crystalline substance, *ricinelaidin*. When distilled in a partial vacuum castor oil yields œnanthol In addition to the above-named constituents it is said to contain an acrid substance *(see Ricini Semina)*, regarded by some as the active principle; it seems probable, however, that the purgative action is due to the ricinolein which it contains.

Adulterations.—The following test is recommended (Conroy):—When 20 c.c. each of castor oil and petroleum ether are well shaken together in a tall tube kept for some time at exactly 60° F. the mixture will not become clear, and a layer of petroleum ether will collect on the surface. If the mixture be raised to 70° F. it will become clear. If the castor oil be adulterated with 5 per cent. of another fixed oil, the mixture will clear at 60° F. and there will be no separation of ether. The U.S.P. states that "if 3 c.c. of the oil be shaken for a few minutes with 3 c.c. of carbon disulphide and 1 c.c. of sulphuric acid, the mixture should not acquire a black-brown colour" (absence of many foreign oils). Castor oil is said to be dextro-rotatory, thus differing from other fixed oils, but this character is not generally confirmed.

Uses, etc.—As demulcent and cathartic. *Dose.*—1-8 fluid drachms.

B.P. Preparations.

Collodium Flexile - - -	1 in 50, about.
Linimentum Sinapis Compositum	1 fl. drachm to 1 fl. oz.
Mistura Olei Ricini - - -	3 in 8.
Pilula Hydrargyri Subchloridi Composita.	

OLEUM SINAPIS EXPRESSUM.—Expressed oil of Mustard.—The oil expressed from the seeds of Brassica Alba and Brassica Nigra.

N.O.—Cruciferæ.

Habitat.—Britain.

Characters.— Reddish or brownish-yellow, non-drying, mild-tasting, and not readily becoming rancid, solidifying when cooled to 180° C. S.G. 0·916 to 0·920.

Chemistry.—Consists of glycerides of *oleic*, *stearic*, *erucic* (*brassic*), *sinapoleic* and *behenic acids.*

Uses, etc.—For purposes similar to olive and rape oils. As diluent of essential of mustard in preparing liniments, etc.

Note.—This oil is obtained as a bye-product in the manufacture of "mustard leaves," the rubefacient portion of which consists of the crushed seeds deprived of the fixed oil, but retaining the sinigrin.

OLEUM COLZÆ.—Rape Oil.—The oil expressed from the seeds of Brassica campestris and of other species of Brassica.

N.O.—Cruciferæ.

Habitat. —Europe.

Characters.—Yellowish-brown or brownish-green, viscid, of a peculiar odour and pungent taste ; when refined, lighter in colour and almost tasteless. It has s.g. 0·915 and solidifies at about—6° C.

Chemistry.—Glycerides of *stearic* and *brassic* (*erucic*) acids, with traces of sulphur-containing esters.

Uses, etc.—As olive oil, etc. Largely as a liniment.

OLEUM PAPAVERIS.—Poppy Seed Oil.—The oil expressed from the seeds of Papaver somniferum.

N.O.—Papaveraceæ.

Habitat.—W. Asia ; cultivated.

Characters and Tests.—Straw-yellow, limpid, odourless, and having a sweet taste. S.G. 0·924 to 0·927 ; solidifies at —18° C. ; soluble in 25 parts alcohol ; dries rapidly.

Chemistry.—Very similar to linseed oil. Contains *linolein*, *palmitin*, *myristin*, etc.

Uses, etc.—As demulcent, etc. ; in the arts for purposes similar to linseed oil ; said to be used for adulterating olive oil.

OLEUM JUGLANDIS—Oil of Walnut.—The oil expressed from the ripe kernels of Juglans regia.

N.O.—Juglandeæ.

Habitat.—Central Asia ; cultivated.

Characters, etc.—Golden straw-yellow in colour, almost without odour, and having a pleasant nutty taste. S.G. 0·925. Solidifies at —15° C. Dries rapidly.

Chemistry.—Similar to linseed oil.

Uses, etc.—For purposes similar to those for which other bland fixed oils are used ; also in the arts.

Note.—Similar oils are contained in the fruit of JUGLANS CINEREA (the butternut), J. NIGRA, CARYA OLIVÆFORMIS (peccan nut), and in hickory nuts.

OLEUM SESAMI.—Sesame Oil.—The oil expressed from the seeds of Sesamum Indicum.

N.O.—Pedalineæ.

Habitat.—India ; cultivated.

Syn.—Benné oil, teel oil, gingili oil.

Characters.—Colour yellow, very limpid, with little odour, and having a bland and agreeable taste. S.G. 0·921 to 0·924. Solidifies below 5° C. Dries imperfectly.

Chemistry.—*Olein* (about 75 per cent.), together with *myristin, palmitin, stearin* and a resin.

Uses, etc.—Similar to cotton-seed oil.

Note.—Sesamé oil may be distinguished from cotton-seed oil by giving a white mixture with an equal volume of nitric acid which, after standing from 12 to 18 hours, is still liquid (cotton-seed oil, when this test is applied, becomes yellowish-brown in colour, and finally semi-solid in consistence). A characteristic test for sesamé oil made use of in detecting its presence in olive oil is as follows:—10 c.c. shaken ten minutes with 5 c.c. of hydrochloric acid (s.g. 1·17), in which one-tenth gramme sugar has been dissolved, produces a rose-tint in the acid layer.

OLEUM CANNABIS—Hemp-seed Oil.—The oil expressed from the fruit of Cannabis sativa.

N.O.—Urticaceæ.

Habitat.—Asia; cultivated.

Characters and Tests.—Greenish-yellow, becoming brown on keeping; odour hemp-like, unpleasant; taste bland; s.g. 0·925 to 0·931. Dries rapidly on exposure.

Chemistry, Uses, etc.—Similar to linseed oil.

OLEUM GOSSYPII.—Cotton-seed Oil.—The oil obtained by expression from the seeds of Gossypium herbaceum.

N.O.—Malvaceæ.

Habitat.—Asia, Africa; cultivated.

Characters.—In the crude condition the oil is dark-red in colour and has s.g. 0·928 to 0·930. After refining it has s.g. 0·922 to 0·926, is of a straw-yellow colour, or nearly colourless, is free from acridity, has a bland taste, and is almost colourless. It congeals below 0° C., is non-drying, and the combined fat acids melt at 38° C.

Chemistry.—It contains *olein, stearin*, and, in its crude condition, about one per cent. of colouring matter.

Uses, etc.—In place of, and for adulterating, olive oil. Has been found mixed as a sophisticant with most fixed oils of greater value.

OLEUM MORRHUÆ.—Cod-liver Oil.—The oil extracted from the fresh liver of the cod, Gadus Morrhua, by the application of a heat not exceeding 180° F. (82°·2 C.)

CLASS—PISCES.

N.O.—Teleostea. *Family*—Gadidæ.

Syn.—Oleum Jecoris Aselli.

Characters and Tests.—Pale yellow, with a slight fishy odour, and bland fishy taste. A drop of sulphuric acid added to a few drops of the oil on a porcelain slab develops a violet colour which soon passes to a yellowish or brownish red. S.G. 0·920 to 0·925, scarcely soluble in alcohol, readily soluble in ether, chloroform, etc.

Note.—The oil should be only slightly acid to litmus paper when moistened with alcohol, and when cooled to 0° C. should not deposit granules of fat. If two or three drops of fuming nitric acid be allowed to flow alongside ten or fifteen drops of the oil contained in a watch glass, a red colour should be obtained at the point of contact. On stirring the mixture with a glass rod this colour becomes bright rose-red, soon changing to lemon-yellow (distinction from *seal oil* which at first shows no change of colour and from *other fish oils* which become at first blue and afterwards brown and yellow).—U.S.P. Cod-liver oil is remarkable for the great increase of temperature produced by treating it with sulphuric acid and for its high iodine absorption. These characters distinguish it from most other oils except liver oils.

Method of Preparing Cod-liver Oil.—Previous to the introduction—about forty years ago—of the steam process (*see below*) for making cod-liver oil the methods of manufacture may be summed up in the word, "putrefaction." The livers of the cod, after removal, were thrown into barrels which, when full, were headed up and kept until the end of the season, when they were carried off by the fishermen to their homes. The livers by this time would be in a state of putrefaction, varying in extent with the time which had elapsed after being "barrelled" and with the temperature of the weather to which they had been subjected. By the bursting of the hepatic cells of the livers a certain amount of oil would by this time have been set free to float on the top of the barrel: this, if present in sufficient quantity, would be skimmed off and set aside as *raw medicinal oil*, which is a pale-yellow product of a not unpleasant taste and odour. The contents of the barrel would now be stirred, and, after the lapse of a few days or weeks, the surface oil again skimmed off, the product this time being known as *pale oil.* A repetition of the stirring and further exposure to weather, now much warmer, resulted in the production of a third skimming—*pale-brown oil.* The three qualities of oil thus obtained are collectively known as *natural oil*, and owe their differences in properties and colour to the proportion of putrefactive products present in them. When no further skimmings of oil could be obtained the dregs of the barrels were thrown into iron pots and subjected to a heat considerably above 100° C. The product thus obtained after straining from the remains of the livers is known as *brown oil*, and finds use chiefly amongst curriers. Brown oil is also produced from the dregs obtained in steam factories, and this differs but little from that yielded in the natural oil making process. Natural oil produced in the manner described above is still largely manufactured especially in those parts of the coasts where the supply of livers is not sufficient to warrant the erection of steam factories.

The "steam process" of preparing cod-liver oil has now been in use for over forty years, and by far the larger proportion of the oil used in British medicine is procured by means of it. The process consists in use of steam heat for removing the oil from the fresh livers, the heat being supplied either by means of a water-bath or of a steam-jacketed pan. On shipboard a considerable quantity of oil is produced by passing steam into a wooden cask-like vessel filled with livers; this method affords the quickest yield of oil in the minimum of time. After the oil has been set free from the liver, by means of the heat employed, it is drawn off and may be cooled down till the higher melting-point fats crystallize; these are then removed by filtering. The remains of the livers may be pressed and so made to yield more oil (of a dark colour and inferior quality), or are used for obtaining brown oil in the same manner as is adopted in the manufacture of natural oil. Bleaching by exposure to the sun's rays is said to be used by some manufacturers, but since it is carried on with a view of removing colour from dark-coloured oils, it is a process which cannot be recommended.

Comparison of Oils of different Countries.—The bulk of the oil of commerce is obtained from Norway, where the finest is obtained. Cod-liver oil has been and is still produced in Iceland, Great Britain, Russia, Japan and N. America. In the case of the three first-named countries, in the absence of supply sufficient to keep steam factories going, much of the oil is of the natural class, and when steam-prepared is of an inferior quality. In America a so-called *shore oil* is produced by steam process, and *straits* and *banks* oil corresponding to the pale and brown oil of Norway are prepared by the fishermen, but the "shore" oil is said to be of a quality much inferior to that of the Norwegian product. Steam-prepared Japanese oil, from the liver of the Japanese codfish (GADUS BRANDTI), has now for some years been offered, but has so far not met with much favour in European markets.

Adulterations of Cod-liver Oil.—Oils from the livers of fish allied to the cod have been, and still are to some extent, used for the purposes of adulteration, as also are seal oil, whale oil, skate oil and shark oil. Adulteration may occur either from the use of livers other than those of the cod or from the admixture of foreign oils with the finished cod oil. Haddock oil of British manufacture has been largely substituted for cod-liver oil in this country. In Lofoten, which is the source of the finest Norwegian oil, adulteration by admixture of other livers is highly improbable since, during the winter fishing season, cod-fish forms the only available material from which oil of any kind can be procured ; any adulteration which takes place must, therefore, be by addition of foreign oils.

Chemistry of Cod-liver Oil.—Cod-liver oil contains about 95 per cent. of fat, 83 to 85 parts of which are described as *olein*, the remainder being *palmitin* and *stearin* (about 10 per cent.), with smaller quantities of volatile fatty esters. In steam-prepared oil the free fat acids amount to about 0·36 per cent. oleic acid, while in "natural" pale-brown and brown oils there is from 20 to 50 per cent. There are also present small quantities of *cholesterin*, colouring matter (*lipochrome*, found also in palm oil), and in "natural" oil the following alkaloids belonging to the class of leucomaïnes, viz., *butylamine*, *amylamine*, *hexylamine*, *dihydro-lutidine*, together with the fixed bases, *asseline* and *morrhuine*. Traces of bromine, iodine and phosphorus are also present : iodine to the extent of from three to four parts in one million parts. In addition to the above, traces of inorganic salts, chlorides, sulphates and phosphates of lime, magnesia and soda, etc., are found. The *gaduin* of De Jongh was probably a decomposition product produced in course of analysis. The substance *morrhuol*, obtained by Chapoteaut from cod-liver oil (more especially the brown and pale-brown varieties) is probably a mixture of the putrefactive products formed by exposure of the livers before removing the oil.

Note.—The recent researches of Heyerdahl, which await confirmation, deny the presence of either olein or stearin in cod-liver oil, but assert the discovery of two previously unknown, unsaturated fat acids. These glycerides are by him called respectively *jecolein* and *therapin*, and they are said to be present to the extent of 20 per cent. in each case. Palmitin he also discovers to the extent of about four per cent., and states that it is the only saturated body contained in the oil. The same chemist attributes the rancidity of cod oil not to the presence of free acids, but to the conversion of jecoleic and therapic acids into hydroxyl acids (to this they, he says, are peculiarly liable), and he advocates the complete exclusion of air from the oil during manufacture.

Uses, etc.—As nutrient and demulcent in cases of defective digestion ; given in emulsion, in capsules, and mixed with malt extract, etc. *Dose.*—1-8 drachms.

OLEUM THEOBROMATIS.—Oil of Theobroma.—A concrete oil obtained by expression and heat from the ground seeds of Theobroma Cacao.

N.O.—Sterculiaceæ.

Syn.—Butyrum Cacao, Cacao Butter.

Habitat.—Demarara and Mexico.

Characters.—Of the consistency of tallow ; colour yellowish ; odour resembling that of chocolate ; taste bland and agreeable ; fracture clean, presenting no appearance of foreign matter. Does not become rancid from exposure to the air. It usually melts at temperatures between 86° and 95° F. (30° and 35° C.)

Method of Production.—The process usually adopted for obtaining oil of theobroma from the seeds is that of expression between hot iron plates or rollers. It may also be obtained by decoction and by the action of solvents.

Chemistry, etc.—S.G. at 15° C. 0·970 to 0·980 ; soluble in ether, acetic ether, and in 20 parts of hot alcohol. Consists of the glycerides of *stearic*, *oleic* and, in less proportion, *lauric*, *palmitic* and *arachidic acids*. It is also said to contain a peculiar substance, *theobromic acid*, $C_{64}H_{128}O_2$.

Adulterations.—"If 1 gramme be dissolved in 3 c.c. of ether in a test-tube, at a temperature of 17° C., and the tube be subsequently plunged into water at 0° C., the liquid should not become turbid nor deposit a granular mass in less than 3 minutes ; and if the mixture, after congealing, be exposed to a temperature of 15° C. it should gradually form a perfectly clear liquid (absence of *paraffin, wax, stearin, tallow*), etc."—U.S.P.

Uses, etc.—As base for suppositories, pessaries, etc., and in the preparation of ointments, plasters, etc.

B.P. Preparations.

Suppositoria Acidi Tannici.
,, Hydrargyri.
,, Iodoformi.
,, Morphinæ.
,, Plumbi Composita.

Note.—The advantages possessed by Cacao Butter as an ingredient of suppositories are due to its melting point—the temperature of this being somewhat lower than that of the blood.

OLEUM PALMÆ.—A fixed oil obtained by expression from the fruit of Elais guineensis and of other palms.

N.O.—Palmeæ.

Habitat.—Africa, West Indies and South America.

Characters.—Of the consistence of butter ; it has a rich orange-yellow colour, sweetish taste and an agreeable odour, compared by some to that of violets, by others to that of the Florentine orris. Becomes rancid and of a paler colour by age. It melts with the heat of the hand, and in a molten state may easily be filtered through blotting paper. It is soluble in absolute alcohol and in ether. S.G. 0·920 to 0·926 ; melting-point, 27° C.

Chemistry.—Glycerides of *palmitic* and *oleic acids*, with a yellow colouring matter (*lipochrome*). It usually contains a considerable portion of free fatty acids, the percentage varying from 11 to 70.

Uses, etc.—For ointments ; also in soap and candle making and as a lubricant

Adulterations.—Lard and suet, coloured with turmeric and scented with Florentine orris-root.

Note.—Palm oil proper is from the outer coating of the seed, a product (*Palm-nut oil*) of lighter colour and, in most respects, resembling cocoa-nut oil being found in the kernels. Commercial palm oil is a very variable product, samples differing in colour, in consistency and in purity. The Calabar oil is one of the best kinds.

OLEUM COCOIS.—Cocoa-Nut Oil.—The oil obtained either by expression or decoction from the fruit of the Cocoa-nut Palm, Cocos nucifera.

N.O.—Palmeæ.

Habitat.—All tropical countries.

Characters.—Fine white colour, of the consistence of lard at ordinary temperatures, becoming solid like suet between 4·4° and 10° C., and liquid at about 26·6° C.; taste bland and peculiar; odour not disagreeable. Readily soluble in alcohol.

Chemistry.—*Cocinin*, a peculiar fatty principle, which, by saponification, yields *cocinic acid* and a small quantity of olein. It also contains the glycerides of *lauric*, *myristic* and *palmitic* acids, with the volatile fatty *capric*, *caprylic* and *caproic* acids.

Uses, etc.—Internally as demulcent and nutrient; externally as substitute for lard. Cocoa-nut oil soap, not being precipitated by sodium chloride, is useful for sea water washing.

Note.—*Cocoa-nut stearine* obtained by subjecting the oil to hydraulic pressure, has melting point about 28° C., and is recommended by Squire as a basis for suppositories preferable to Theobroma oil.

OLEUM GYNOCARDIÆ.—Chaulmoogra Oil.—The oil expressed from the seeds of Gynocardia odorata.

N.O.—Bixaceæ.

Habitat.—Malayan Peninsula.

Characters.—When pure, of a whitish to yellowish colour, having s.g. 0·900 and melting-point 40° to 42° C. It has an acid reaction and a strong characteristic odour.

Chemistry.—Consists of glycerides of *gynocardic*, *palmitic*, *hypogæic* and *cocinic acids*, the two first-named being also present as free acids. Gynocardic acid ($C_{14}H_{24}O_2$) is a crystallizable fat, said to be the active principle of the oil.

ADEPS PRÆPARATUS.—Prepared Lard.

The purified fat of the hog, Sus scrofa.

CLASS—MAMMALIA.

N.O.—Pachydermata.

Syn.—Axungia, Adeps Porci.

Take of the internal fat of the abdomen of the hog, perfectly fresh, any convenient quantity, remove as much of the external membranes as possible, and suspend the fat so that it shall be freely exposed to the air for some hours; then cut it into small pieces and beat these in a stone mortar until they are thus, or by some equivalent process, reduced to a uniform mass in which the membranous vesicles are completely broken. Put the mass thus produced into a vessel surrounded by warm water and apply a temperature not exceeding 130° F. (54°·4 C.) until the fat has melted and separated from the membranous matter. Finally strain the melted fat through flannel.

Characters and Tests.—A soft, white fatty substance, melting at about 100° F. (37°·8 C.) Has no rancid odour; dissolves entirely in ether. Distilled water in which it has been boiled, when cooled and filtered, gives no precipitate with nitrate of silver (absence of *salt*) and is not rendered blue by the addition of solution of iodine (absence of *starch*). After perfect saponification with caustic potash solution, the resulting soap should be soluble in 40 parts of warm water and 10 parts of spirit.

Chemistry, etc.—S.G. about 0·932 at 15° C., or 0·860 to 0·861 at 98° to 99° C. Consists of a mixture of *olein* (about 50 per cent.), *palmitin* and *stearin*. The melting-point varies somewhat with the part of the animal used for obtaining the fat, that of the omentum *(adeps omenti)* being higher.

Adulterations.—Amongst the substances used for this purpose are—water, which may be detected by heating the lard on a water bath to a constant weight; cocoa-nut oil, which causes an increase in density; cotton-seed oil or cotton-seed stearin, which may be detected by a test similar to that used in the case of olive oil *(which see)*; starch, for the detection of which, and of salt, the B.P. gives tests. Mineral additions may be detected by igniting the lard, which should leave no residue. Free acid (rancidity) should not be removed by treating lard with alcohol.

Uses, etc.—As emollient, demulcent, etc.; in the preparation of ointments.

B.P. Preparations.

Adeps Benzoatus.
Emplastrum Cantharidis.
Unguentum Iodi.
,, Terebinthinæ.
,, Hydrargyri Nitratis.
,, Hydrargyri.

Note.—Lard oil (Oleum adipis, U.S.P.) is a fixed oil expressed from lard at a low temperature. It is a colourless or pale-yellow oily liquid, having a peculiar odour and a bland taste. S.G. 0·910 to 0·915 at 15° C. It consists chiefly of olein with varying proportions of palmitin and stearin. It is used largely as a lubricant as well as in pharmacy.

OLEUM BUBULUM.—Neats' Foot Oil.—The oil obtained from the feet of various cattle by the action of boiling water with subsequent separation.

Syn.—Oleum pedum tauri, oleum nervinum.

Characters and Tests.—Yellowish, odourless, with a bland taste; not liable to become rancid; s.g. about 0·916; solidifies below 0° C. Combined fat acids melt at 30° C.

Chemistry.—Consists of *olein*, *palmitin*, *stearin*, etc.

Uses, etc.—Externally in pomades, etc. On account of its low solidifying point useful in lubricating machinery worked at a low temperature.

CETACEUM.—Spermaceti.—A concrete fatty substance obtained, mixed with oil, from the head of the Sperm Whale (the Great-headed Cachalot), Physeter macrocephalus. It is separated from the oil by filtration and pressure and afterwards purified.

CLASS—MAMMALIA.
N.O.—Cetacea.

Habitat.—The Pacific and Indian Oceans.

Characters and Tests.—Crystalline, pearly-white, glistening, translucent, with little taste or odour, reducible to powder by the addition of a little rectified spirit. Scarcely unctuous to the touch. Melting point 111° to 122° F. (43°·9 to 50° C.) when tested by the method described in connection with Cera Flava.

Method of Production, etc.—As the specific name of this mammal indicates, it has a large head, the superior portion of which consists of large cartilaginous cavities filled with oily matter (sperm oil and spermaceti). A hole is made into this space, when the liquid contents exude and are collected. This is known as head matter, and is placed in hair bags and subjected to hydraulic pressure, which separates nearly all the oil. The spermaceti is then re-melted in water, the impurities being skimmed off. Subsequently it is again melted in a weak solution of potash, and finally allowed to assume large crystalline masses. The oil from the blubber also contains spermaceti, and is used for obtaining it.

Chemistry.—S.G. 0·942 to 0·946 at 15.5° C., or 0·808 to 0·812 at 100° C. Consists almost entirely of *cetin (palmitate of cetyl)*, $C_{16}H_{33}O.C_{16}H_{31}O$, which, on saponification, yields palmitic acid and *cetyl alcohol (ethal)*; small quantities of lauric, myristic and stearic acids, combined with alcohols of the same series as ethal, are also present.

Adulterations.—For this purpose stearin, tallow and paraffin wax are said to be used. The two former may be detected by noting the large percentage of caustic potash (KHO) required to saponify the sample (spermaceti when pure requires 12·8 per cent.); paraffin on the other hand is non-saponifiable and cannot be destroyed by strong sulphuric acid.

Uses, etc.—Internally as demulcent, emollient, etc., externally in ointments, etc.

B.P. Preparations.

Charta Epispastica.
Unguentum Cetacei.

Note.—ADDITIONAL PRODUCTS OF THE SPERM WHALE.—*Ambergris (Ambra gris).*—The indurate fæces, probably somewhat altered by disease, of the Sperm Whale. *Characters.*—A solid, opaque, greyish, striated substance, having an odour of musk. S.G. 0·908 to 0·920. *Chemistry.*—*Ambreine* (85 per cent.), a peculiar, non-saponifiable fat soluble in alcohol; benzoic acid (2·5 per cent); sodium chloride (1·5 per cent.) and other matters.

Sperm oil (*Oleum spermæ*) is the liquid oil obtained from the head-cavities (which yield also spermaceti) and blubber of the sperm whale. It is a clear, thin, neutral oil, of a pale-brown colour, possessing but little odour; it does not become thick on exposure to air, and remains fluid at 18° C. S.G. 0.875 to 0·883. According to Stenhouse, sperm oil appears to be isomeric with cetin; while Hofstadter says that when saponified it gives off ammonia with traces of methylamine, and yields physetoleic acid, valerianic acid, small quantities of solid fatty acids, with a small quantity of glycerine. It is somewhat unstable. About four per cent. of cetin is present in good oils. After saponification sperm oil yields 39 to 41 per cent. of unsaponifiable matter, which is soluble in ether, and of a pale-yellow colour. As no animal or vegetable oil is known to yield more than two per cent. of ether soluble material after saponification, we have in this a method of detecting impurities.—(Allen.) It is largely used as a lubricant, being especially suited for that purpose on account of its freedom from any tendency to becoming thick or rancid on exposure.

ALLIED MARINE OILS.—*Doegling oil* (*Bottle-nose oil*) is obtained from the Bottle-nose Whale (RHYNCOCETUS), and is known in commerce as *Arctic sperm oil;* it is in all respects very similar to sperm oil.

Whale oil (*train oil*) is obtained from the blubber of BALÆNA MYSTICETUS (*the Right or Greenland Whale*) and allied species. It has a disagreeable fishy odour, is yellow or brown in colour, and deposits stearin when cooled, has drying properties and contains glycerides of valeric acid. S.G. 0·924 to 0·929.

Porpoise oil is obtained from DELPHINUS PHOCÆNA (*black porpoise*) and from other marine species. It much resembles whale oil.

Dolphin oil is obtained from Delphinus Delphis (globiceps); it contains spermaceti, but in other respects is similar to porpoise oil.

Seal oil, from various species of Phoca, has s.g. 0·915 to 0·930, and is similar to porpoise oil.

Dugong oil is obtained from the blubber of the herbivorous cetacean, Halicore Dugong, inhabiting the shallow waters of tropical seas, especially shores of Indian, Malayan and Australian Seas. A full-grown dugong (eight to twelve feet long, and weighing about one ton) yields from ten to twelve gallons of oil. The oil is an opaque fluid at ordinary temperatures, and in cold weather forms a thick mass. It does not contain iodine, and is said to possess all the properties of cod-liver oil without its nauseous taste.

Shark oil, from the liver of Squalus Marinus and other fish, has been used by curriers as a substitute for cod-liver oil. It has s.g. 0·911 to 0·929, is of a clear yellow colour and contains much *cholesterin*. It has been much adulterated with oils of low specific gravity.

SEVUM PRÆPARATUM—Prepared Suet.

The internal fat of the abdomen of the sheep, Ovis Aries, purified by melting and straining.

CLASS—MAMMALIA.

N.O.—Ruminantia.

Syn.—Mutton suet.

Characters.—White, smooth, almost scentless, fusible at 103° F. (39·4° C.)

Note.—The melting point given by the B.P. is too low; the temperature of this varies between 45° and 50° C.

Chemistry.—*Stearin*, *palmitin* (70 per cent.), *olein* (30 per cent.), with a trace of free fat acids. It is soluble in ether, insoluble in alcohol.

Uses, etc.—In ointments, plasters, etc.

B.P. Preparations.

Emplastrum Cantharidis.
Unguentum Hydrargyri.

Note.—*Beef suet* has a very similar composition to the above, but melts at a slightly lower temperature.

CERA FLAVA.—Yellow Wax.—Prepared from the honeycomb of the Hive Bee, Apis mellifica.

CLASS—INSECTA.

N.O.—Hymenoptera.

Habitat.—England, Europe, etc.

Characters and Tests.—Firm, breaking with a granular fracture, yellowish, having an agreeable honey-like odour. Not unctuous to the touch. Should be readily and entirely soluble in hot oil of turpentine. Should not yield more than three per cent. to cold rectified spirit [absence of *resin*] and nothing to water, or to a boiling solution of soda, the two latter fluids after filtration neither being turbid nor yielding a precipitate on the addition of hydrochloric acid [absence of *soap*, *fats*, *fat acids*, *Japan wax*, *resin*]. Specific gravity 0·950 to 0·970. Melts at 146° F. (63°·3 C.) when tested in the following manner:—Liquefy a few grains and draw a little of the fluid up into a capillary tube ; fix a piece of the filled capillary tube to the bulb of a thermometer by thread ; immerse the bulb and tube in a beaker of water and heat the latter gently ; at the moment the opaque rod of wax becomes transparent, note the temperature. The solidifying point is two to three degrees lower than the melting point. Boiling water in which it has been agitated is not, when cooled, rendered blue by iodine.—[Absence of *starch*, *flour*, etc.]

Method of Production, etc.—After the removal of the honey the comb is subjected to pressure and treated with hot water. The wax rises to the surface, is allowed to cool and, when solid, is removed. Amongst the varieties met with in commerce the following may be mentioned :—*English French*, *Italian*, *African* (*Madagascar*, *Gambia*), *Australian*, *Chilian*, *Mogador*, *Mauritius*, *E. Indian* and *Jamaica*. Of these the kind most valued in this country is English wax. The tropical waxes frequently contain much dirt and similar impurities.

Chemistry.—*Cerolein* (aromatic and colouring matter), 3-5 per cent. ; *cerotic acid (cerin)*, $C_{26}H_{53}COOH$, about 10-20 per cent.; *myricin (myricyl palmitate)*, $C_{30}H_{61}.C_{16}H_{31}O_2$, about 80-90 per cent. Cerolein is soluble in cold alcohol ; cerotic acid in boiling alcohol ; myricin is insoluble in alcohol. Cerotic acid, which exists in the free state, may be removed by hot alcohol, and is a granular substance, melting at 79° C. ; myricin is a solid wax-like body, melting at 64° C., soluble in benzol, ether and oil of turpentine.

Adulterations.—Bees-wax is not infrequently adulterated. Tests for the detection of several of the substances used are given above, under "Characters and Tests." The melting point and specific gravity are also of the greatest value in testing samples. *Carnaüba* wax may be detected from the increased density, higher melting point, and much greater iodine-absorbing power which its admixture with bees-wax would produce. *Paraffin*, *cerasin* and *ozokerite* resist the action of hot concentrated sulphuric acid and, making use of this fact, the following test is given by the U.S.P. :—5 grammes of the wax heated in a flask for 15 minutes with 25 c.c. of H_2SO_4 to 160° C. and the mixture diluted with water, no solid wax-like body should separate.

Uses, *etc.*—In the making of plasters, ointments, etc.

B.P. Preparations.

Cera Alba.
Emplastrum Calefaciens.
,, Cantharidis.
,, Galbani.
,, Picis.
,, Saponis Fuscum.
Pilula Phosphori.
Unguentum Cantharidis.
,, Hydrargyri Compositum.
,, Picis Liquidæ.
,, Resinæ.
,, Sabinæ.
,, Terebinthinæ.

CERA ALBA.—White Wax.—Yellow wax bleached by exposure to moisture, air and light.

Syn.—Cera dealbata.

Habitat.—England, Europe, etc.

Characters and Tests.—Hard, nearly white, translucent. It should respond to the tests for yellow wax.

Note.—The constitution of bees-wax undergoes some changes in the bleaching process; the melting point is more variable and the specific gravity is usually somewhat higher.

Uses, etc.—In ointments, etc.

B.P. Preparations.

Charta Epispastica.
Unguentum Cetacei.
*Unguentum Simplex.

* *Which is contained in* Unguenta–Antimonii Tartarati, Creasoti, Elemi, Hydrargyri Ammoniati, Hydrargyri Iodidi Rubri, Plumbi Carbonatis, Plumbi Iodidi, Resinæ.

Note.—White Wax of Commerce.—This is usually met with in elegant white cakes and is a mixture of purified bees-wax with other substances, such as paraffin, spermaceti, Japan wax, etc. For making cold cream, for laundry use and for other purposes, this mixture, on account of its whiter colour, is preferred to the pure substance.

Japan wax is obtained in Japan by expression and heat, or by the action of solvents, from the fruit of Rhus succedanea. It has s.g. 0·970 to 0·980 and melts at 50° to 53° C. It consists almost entirely of *palmitin*, and is used in candle-making, for adultering white bees-wax, and in making pomades.

Myrtle wax is obtained in the U.S. by boiling the fruit of Myrica cerifera (the wax-myrtle) with water. It has a green colour, is hard, and has a feeble taste and smell. It has s.g. about 1·000 and melts at 45° to 46° C. It consists of glycerides of *stearic* and *myristic acids* and is used in candle-making.

Chinese wax, Insect wax, is the secretion of an insect (Coccus ceriferus) which lives on the *Chinese privet* (Ligustrum lucidum) and other trees. In appearance it much resembles spermaceti, but is harder and more readily powdered. It has s.g. 0·970, melts at 83° C., and consists of *ceryl cerotate* ($C_{27}H_{55}.C_{27}H_{53}O_2$). It is used in the arts for candle-making, etc., and in medicine both internally and externally.

Carnaüba, Canauba, Carnahuba wax is obtained from the leaves of Copernica (Corypha) cerifera. It is a hard, greenish-yellow, usually tasteless and odourless wax of s.g. about 1·000, melting at 80° to 85° C. Its constitution is highly complex, there being present amongst other bodies, *myricyl alcohol* and *cerotic acid* (both free and intercombined). When boiled with caustic potash it assumes a reddish colour, and is only partially saponifiable. It is used in candle-making and as an adulterant of bees-wax (*which see*).

ADEPS LANÆ.—Wool Fat.—The purified cholesterin fat of sheep's wool.

CLASS—MAMMALIA.

N.O.—Ruminantia.

Characters and Tests.—A yellowish, tenacious, unctuous substance; almost inodorous; with a melting point varying from 100° F. (37·8° C.) to 112° F. (44·4° C.); readily soluble in ether and in chloroform, sparingly soluble in rectified spirit. Ten grains should dissolve almost completely in fourteen fluid drachms of boiling ethylic alcohol, the greater part separating in flocks on cooling. Ignited with free access of air it burns, leaving but a trace of ash. Fifty grains dissolved in four fluid drachms of ether, and two drops of tincture of phenol-phtaleïn added should not require more than two grain measures of volumetric solution of soda to produce a permanent red coloration. The solution, in chloroform, poured gently over the surface of sulphuric acid acquires a purplish-red colour. Heated with a solution of soda no ammoniacal odour should be evolved.

Method of Production.—Wool fat may be obtained from sheeps' wool by the action of solvents such as ether, light petroleum, alcohol, etc., or by the process patented by Liebreich, which consists essentially in treating the wool with alkali (which saponifies part of the fat), removing the dirt by centrifugal machinery, precipitating the fat from the alkaline mixture by the addition of acid, and kneading with water. The wool-fat thus obtained contains much water, and is rendered anhydrous by the aid of heat which, when applied, causes the fat to separate, when it is skimmed off from the surface of the separated water.

Chemistry.—Palmitic and stearic esters of *cholesterine*, $C_{26}H_{44}O$, and *iso-cholesterine*, with smaller quantities of glycerides of both the higher and lower fatty acids. Cholesterine is regarded as being a monovalent alcohol, and occurs in various parts of the animal organism, having been first discovered in gall-stones. It unites with fat acids, forming esters similar to the glycerides, is soluble in alcohol and in ether, insoluble in water and cannot be saponified.

Uses, etc.—As basis for ointments, etc. Valued on account of its reputed ready absorption by the skin and absence of tendency to rancidity. It is commonly known by the name of "anhydrous lanoline."

B.P. Preparation.
Adeps Lanæ Hydrosus.

ADEPS LANÆ HYDROSUS.—HYDROUS WOOL-FAT.—Consists of a mixture of 70 parts of wool-fat with 30 parts of water. It is commonly known by the name "lanoline," which is registered as a trade mark.

B.P. Preparation.
Unguentum Conii.

10.—SACCHARINE SUBSTANCES, STARCHES, Etc.

UNDER this head are included substances which are, in the majority of cases, the reserve food materials of the plants which yield them ; they are nearly allied chemically—many of them belonging to the class of bodies known as carbohydrates. This term, which is applied to compounds having the empirical formulæ, $C_6H_{12}O_6$, $C_6H_{10}O_5$ and $C_{12}H_{22}O_{11}$, is somewhat misleading, since it in no way truly represents the constitution of those substances.

SACCHARUM PURIFICATUM.—Refined Sugar.

Syn.—Sucrose.

Note.—The botanical source of sugar is not now given in the B.P. In the '67 edition "pure cane sugar prepared from the juice of the stem of Saccharum officinarum, from plants cultivated in the West Indies and other tropical countries," was specified.

Characters and Tests.—Compact crystalline conical loaves, known in commerce as lump sugar. Readily and completely soluble in water, forming a clear bright syrup which yields no red or yellowish precipitate, or scarcely a trace, on heating it to near the boiling point of water for a short time with a little solution of sulphate of copper and excess of solution of potash.

Method of Production, etc.—Cane sugar is obtained from SACCHARUM OFFICINARUM (*N.O.*—Gramineæ). Recently collected sugar-cane yields 80 per cent. of juice, containing 16 to 21 per cent. of sugar. The juice is neutralised with lime, and concentrated by rapid evaporation in open pans, cooled, and the granular solid product, which constitutes "raw or muscovado sugar," is separated; the liquid portion is known as "treacle" or "molasses." The raw sugar is dissolved in water and purified in a variety of ways. The clear colourless liquid is then concentrated in vacuum pans, and, when sufficiently strong, poured into conical moulds and allowed to crystallise, drain and dry. It is then known as loaf-sugar. The yellow tint of inferior sugars is said to be neutralised by the addition of a little inert blue colouring matter. Of purifying agents, albumen (blood, etc.), sulphurous acid and animal charcoal are said to be used. Sugar is also obtained from the *sugar-beet* (BETA VULGARIS, *N.O.*—Chenopodiaceæ), from the *Chinese sugar maple* (SORGHUM SACCHARATUM), and from the *sugar maple* (ACER SACCHARINUM), and is widely distributed throughout the vegetable kingdom.

Chemistry.—Pure sugar has the formula $C_{12}H_{22}O_{11}$. It is soluble in water, insoluble in alcohol, melts at 160° C. and, by exposure to light and by the action of dilute acids, is "inverted," *i.e.*, broken up into a mixture of *glucose*, $C_6H_{12}O_6$, and *levulose*, $C_6H_{12}O_6$.

Adulterations.—Other sugars, such as glucose, and colouring substances, such as Prussian blue, ultramarine, etc. Chlorides and sulphates should be absent, and its aqueous solution should not be tinged with a yellow colour.

Uses, etc.—As demulcent in coughs, etc.

B.P. Preparations.

Confectio Rosæ Caninæ.
,, ,, Gallicæ.
,, Sennæ.
Extractum Sarsæ Liquidum.
Ferri Carbonas Saccharata.
Liquor Calcis Saccharatus.
Mistura Ferri Composita.
,, Guaiaci.
,, Spiritus Vini Gallici.
Pilula Ferri Iodidi.
Pulvis Amygdalæ Compositus.
,, Cretæ Aromaticus.
,, Glycyrrhizæ Compositus.
,, Tragacanthæ Compositus.
Sodii Citro-tartras Effervescens.
*Syrupus.
All the Syrups and Lozenges.

**Contained in* Confectiones Opii and Scammonii; Misturæ Cretæ and Creasoti; Pilula Cambogiæ Composita; Syrupi

Aurantii, Chloral and Zingiberis; Tinctura Chloroformi et Morphinæ.

Note.—Caramel (*Saccharum ustum*) is obtained by heating sugar to about 200° C. It is a dark-brown mixture of several uncrystallizable decomposition products. Used as a colouring agent.

Saccharum Hordeatum (*Barley-sugar*) is simply sugar melted at about 160° C., with or without the addition of a little tartaric acid, infusion of malt or cream of tartar, and afterwards cooled.

Saccharum Candidum (*Rock or Sugar Candy*) consists of large transparent crystals of sugar of a brown or white colour. It is obtained by slow crystallization from moderately strong solutions of sugar.

Glucose, $C_6H_{12}O_6$ (*Grape sugar, dextrose*), is present in ripe fruits and elsewhere in the vegetable kingdom, where it is usually associated with levulose; it also occurs in most animal fluids. It may be most readily obtained by the action of boiling dilute sulphuric acid on starch; so prepared, it contains dextrin, which is the body formed intermediately during the passage of starch into glucose. It differs from cane-sugar in causing a red precipitate of cuprous oxide when added in solution to a hot alkaline solution of a copper salt. In both the solid and liquid condition it is largely used as a sweetening and preserving agent.

Theriaca (*treacle, molasses*) is a syrupy liquid, of colour varying from golden yellow to brown, obtained as a bye-product in the manufacture of sugar. It is a useful pill excipient.

SACCHARUM LACTIS.—Sugar of Milk.—

A crystallized sugar, obtained from the whey of milk by evaporation.

Syn.—Lactose.

Characters.—Usually in cylindrical masses, two inches in diameter, with a cord or stick in the axis, or in fragments of cakes; greyish-white, crystalline on the surface and in its texture, translucent, hard, scentless, faintly sweet, gritty when chewed. Soluble in about seven parts of water at ordinary temperatures, and in about one part of boiling water.

Method of Production, etc.—According to Thorpe lactose is manufactured in Switzerland on the large scale by the following process:—50,000 litres of whey are directly evaporated to dryness; the residue, weighing about 1,250 kilos, is dissolved in water at 65° C. in copper pans, three-quarters to one kilo of alum is added, the solution is filtered through animal charcoal, boiled down to a syrup and allowed to crystallize on wooden rods. The yield is 55 to 60 per cent. of the crude sugar. Cows' milk contains from $4\frac{1}{2}$ to 5 per cent. of milk sugar. The whey which is used for obtaining it is produced by adding acids to the milk; these have the effect of curdling it, *i.e.*, separating the fat and casein.

Chemistry.—*Lactose*, $C_{12}H_{22}O_{11}.H_2O$, crystallizes with one molecule of water, which may be removed by heating to 130° C. It is less soluble in water than cane sugar, and hence less sweet; is dextro-rotatory; is turned brown by alkalies, and does not reduce Fehling's solution nor undergo alcoholic fermentation. When boiled with diluted sulphuric acid it splits up into a mixture of ordinary *glucose* and isomeric *galactose*. By heating strongly it is converted into caramel.

Uses, etc.—As nutrient and demulcent; also as sweetening agent and for reducing and mixing with more active drugs.

B.P. Preparations.

Pulvis Elaterii Compositus.
Extractum Euonymi Siccum.

Note.—Lactic acid is usually prepared by the fermentation of sugar, and is hence found in sour milk, where it is the result of the action of a species of Bacillus on the lactose.

MEL.—Honey.—A saccharine secretion deposited in the honeycomb by Apis mellifica (the hive or honey bee).

CLASS—INSECTA.

N.O.—Hymenoptera.

Characters and Tests.—When recently separated from the honeycomb it is a viscid translucent liquid, of a light yellowish or brownish-yellowish colour, which gradually becomes partially crystalline and opaque. It has a peculiar odour and a very sweet characteristic taste. Boiled with water for five minutes and allowed to cool, it does not become blue with the solution of iodine [absence of *starch*]. Incinerated it should not yield more than 0·2 per cent. ash, the solution of which in water acidulated with nitric acid should not afford more than a slight turbidity with chloride of barium [absence of *foreign inorganic matter* and of *sulphate* indicating commercial *glucose*].

Note.—The best *virgin* honey is obtained by allowing the cut comb to drain at the ordinary temperature, but, by pressing the residual wax, a less pure variety is obtained. The gradual solidification of honey, which is much retarded by keeping it in the dark, is due to the separation of the dextrose. Pure honey has s.g. 1·446 to 1·448, and, when diluted with twice its volume of water, a syrup, having density from 1·101 to 1·115 is produced, corresponding to 72 and 82 parts per cent. respectively of sugar in the original honey. *Mead* is prepared by the vinous fermentation of diluted honey.

Chemistry.—Moisture, 12 to 23 per cent.; sugar, consisting of *dextrose* and *levulose*, 70 to 80 per cent; cane sugar about 1 per cent.; non-saccharine matter (wax, pollen, traces of volatile oil, insoluble and mineral matters) about 5 per cent. Mannitol is also sometimes present, and all honey is said to contain a small quantity of formic acid, which gives it its good keeping qualities.

Uses, etc.—As demulcent and laxative; also as adjuvant and vehicle.

B.P. Preparation.

Mel Depuratum.

Which is contained in Confectiones Piperis, Scammonii and Terebinthinæ, Mel Boracis, Oxymel and Oxymel Scillæ.

Note.—Adulteration of Honey.—In addition to starch and glucose, for the detection of which the B.P. gives tests, both cane sugar and dextrin have been used to sophisticate honey. The former may be detected by estimating the amount of glucose present before and after "inversion," the difference giving the amount of cane sugar present. Dextrin added alone or present in added glucose, may be detected by mixing the honey with an equal quantity of water and adding to the mixture four times its volume of rectified spirit, which, if dextrin be present, causes the precipitation of white flocculæ.

MANNA.—Manna.—A concrete saccharine exudation obtained by making transverse incisions in the stems of cultivated trees of Fraxinus Ornus.

N.O.—Oleaceæ.

Habitat.—Sicily.

Characters and Tests.—In stalactitic pieces, varying in length and thickness, flat or concave on their inner surface; of a pale yellowish-brown colour, irregularly convex, and nearly white externally. The manna, which is known as flake manna, is crisp, brittle, porous, crystalline in structure and readily soluble in about six parts of water. Odour faint, resembling honey; taste sweet and honey-like, combined with a slight acridity and bitterness. It consists principally of mannite, $C_6H_6(HO)_6$, together with common sugar and indefinite matter. The mannite, which forms from 60 to 80 per cent. of the manna, may be extracted by boiling with fifteen or sixteen parts of rectified spirit, from which it will afterwards separate on cooling in colourless, shining crystals; it requires five parts of cold water for its solution, and this does not undergo vinous fermentation in contact with yeast. Manna contains about ten per cent. of moisture.

Method of Collection, Varieties, etc.—The manna-yielding trees, F. ornus (flowering ash), F. rotundifolia, are cultivated in Sicily and Calabria. During summer they yield manna by exudation, but the flow is increased by making incisions in the bark. The product varies in value according to the time of year when it is collected—that yielded in the summer being the best; thus we have *flake manna*, which has the characters given above, and *sorts manna* (*small manna*), which consists of small tears or fragments, and is obtained in the autumn from the lower parts of the trees.

Chemistry.—Mannitol (mannite), $C_6H_8(OH)_6$ (60-80 per cent.), gum, dextrin, sugar, resin, extractive matter (said to be the purgative principle) and *fraxin* (a glucoside resembling æsculin). Mannitol is a hexahydric alcohol insoluble in alcohol and ether. By the action of heat it becomes *mannitan* ($C_6H_{12}O_5$), by the action of oxydising agents it yields *mannose* ($C_6H_{12}O_6$) and levulose, and it may be prepared artificially by the action of reducing agents on dextrose. It does not admit of alcoholic fermentation, is optically inactive, and has no reducing action on Fehling's solution.

Uses, etc.—A mild laxative. *Dose.*—60 grains to 1 ounce.

Note.—False and Fictitious Mannas.—A number of these, none of which contains mannite, are known. of which the following may be mentioned:—*Briançon manna*, from Larix Europœa, contains a peculiar sugar, *melezitose*. *American manna*, from Pinus lambertiana, contains a sugar known as *pinite*. *Persian manna*, from Alhagi camelorum, contains *melezitose* (*see above*). *Tamarisk manna*, from Tamarix gallica (Persian), contains mucilaginous sugar. *Oak manna*, from Quercus valonia (Kurdistan). *Australian manna*, from Eucalyptus mannifera (N.S. Wales), contain *melitose* isomeric with glucose. Fictitious manna appears to be prepared with potato sugar, *i.e.*, sugar obtained from potato starch by means of ebullition with dilute snlphuric acid. As this acid is subsequently neutralized with lime, there is generally present some calcium sulphate, which would be present in the ash left on ignition. *Sorbin* ($C_6H_{12}O_6$) is a fermentible sugar contained in the fruit of the mountain ash, Sorbus aucuparia.

FARINA TRITICI.—Wheaten Flour.—The grain of Triticum sativum, ground and sifted.

N.O.—Gramineæ.

Habitat.—Cultivated in all temperate parts of the world.

Characters.—A very fine white powder, without odour, and of an insipid taste. Under the microscope the starch granules, of which it is largely composed, are seen to be as described under "Amylum," No. 1.

Note.—The husk or *bran* of wheat constitutes 25-33 per cent. of the whole, and contains the greater part of the mineral matter (phosphates, etc.) present in the grain.

Chemistry.—The following figures give the average percentage of whole wheaten flour:—Moisture, 11·1; starch, 62·3; fat, 1·2; cellulose, 8·3; gum and sugar, 3·8; albuminoids, 10·9; ash, 1·6. The albuminoids present are commonly known under the name *gluten*, but consist of two substances, viz., true gluten *(gluten fibrin)*, which is soluble in dilute alcohol and *vegetable albumin (gliadin)*, insoluble in alcohol; to the presence of this latter the flour owes its adhesive qualities. The ash of wheat flour consists largely of phosphates, including aluminium phosphate.

Uses, etc.—Nutrient, demulcent, etc.

B.P. Preparation.

Cataplasma Fermenti.

Note.—*Mica panis* (bread crumb) is a useful pill excipient. *Vermicelli* and *macaroni* are prepared from wheaten flour.

AMYLUM.—Starch.—The starch procured from the grains of common wheat, Triticum sativum (Triticum vulgare), maize, Zea Mays, and rice, Oryza sativa.

Habitat of Triticum Vulgare.—Cultivated in all temperate parts of the world.

Habitat of Zea Mays.—America, Africa, and India.

Habitat of Oryza Sativa.—Cultivated in tropical countries.

N.O.—Gramineæ.

Characters and Tests.—In fine powder, or in irregular angular or columnar masses, which are readily reduced to powder; white, inodorous. When lightly rubbed in a mortar with a little cold distilled water, the mixture is neither acid nor alkaline to test-paper, and the filtered liquid does not become blue on the addition of solution of iodine. Mixed with boiling water and cooled, it gives a deep blue colour with iodine. Under the microscope these varieties of starch present the following characters:—1. *Wheat starch*: A mixture of large and small granules, which are lenticular in form, and marked with faint concentric striæ surrounding a nearly central hilum. 2. *Maize starch*: Granules more uniform in size, frequently polygonal, somewhat smaller than the large granules of wheat starch, and having a very distinct hilum but without evident concentric striæ. 3. *Rice starch*: Granules extremely minute, nearly uniform in size, polygonal, hilum small and without striæ.

Note.—The size of the granules varies in different plants from 0·002 to 0·185 millimetres in diameter.

Mode of Preparation, etc.—The average percentage of starch present in the three kinds of grain enumerated by the B.P. are, in wheat—54-65 per cent.; maize—54-58 per cent.; rice—75-77 per cent. In preparing starch from wheat, it is usual to allow fermentation to set set up first in order that the lactic acid formed may soften and partly dissolve the glutinous envelopes in which the starch grains are imbedded. This is done by macerating the grain in warm water for a few days, crushing it by hydraulic pressure and subsequently elutriating the starch liquor with successive quantities of water. The milky liquor is then allowed to stand till fermentation sets up and the mass is afterwards washed by decantation. Finally the liquor is stirred to keep the starch in suspension, and passed through fine sieves which allow the passage of the purified starch. This is finally drained on linen cloths and dried at a gentle heat.

Chemistry.—($C_6H_{10}O_5$).—The layers of the starch grain consist of an outer thin portion of *starch-cellulose* surrounding the inner *starch-granulose.* These substances may be separated by washing the crushed grains with cold water, by which means the granulose is removed, the starch-cellulose being left behind. Starch is insoluble in cold water, in alcohol, and in all other liquids. When boiled with water the grains swell, burst, and partially dissolve to form a solution from which alcohol precipitates a white powder, *soluble starch.* Boiled with dilute sulphuric acid, starch becomes converted into a mixture of dextrine and glucose. By the action of extract of malt (which contains diastase) starch is converted into a mixture of dextrin and maltose, the proportion of these varying according to the temperature made use of. Heated from 160° to 200° C., starch becomes converted into dextrin. Starch paste, starch granulose and soluble starch give a blue colour with iodine ; starch cellulose a yellow.

Uses, etc.—As demulcent and vehicle for all kinds of medicaments ; externally to skin, for drying, etc.

B.P. Preparations.

†Glycerinum Amyli	1 in 8½.
*Mucilago Amyli	1 grain in 40 minims.
Pulvis Tragacanthæ Compositus.	

†*Used in preparing* Suppositoria–Acidi Tannici cum Sapone, Acidi Carbolici c Sapone, Morphinæ cum Sapone.

**Used in preparing* Enemata–Aloes, Magnesii Sulphatis, Opii, Terebinthinæ.

TAPIOCA.—Tapioca.—The dried starch deposited from the expressed juice of the rhizome of the *Cassava* plant, Manihot utilissima (Jatropha Manihot), and Manihot Aipi.

N.O.—Euphorbiaceæ.

Habitat.—South America.

Characters.—Irregular, hard, white, rough grains, possessing little taste, partially soluble in cold water, and affording a fine blue colour when iodine solution is added to its filtered solution. The entire granules under the microscope are seen to be muller-shaped.

Uses, etc.—As nutrient.

Note.—There are two varieties of the tapioca-yielding plant—the sweet cassava and the bitter—the latter containing hydrocyanic acid. The roots are tubercular and abound in a milky juice ; both yield cassava meal, which is the pounded residual cake left after expressing the juice from the rasped roots. *Cassava bread* is made from the meal in the usual way, and differs from our bread in the valuable property of keeping any length of time, and hence is the staple food of tropical South America. *Tapioca meal* is the starch deposited from the expressed juice, washed, and dried without heat. Tapioca is obtained by drying the moist meal on hot plates. "*Casaveen*" is a sauce prepared from the juice by boiling with condiments; it is blackish and viscid, and the hydrocyanic acid is got rid of by the boiling. The sweet root is eaten at table; and the bitter (after drying) with the sweet roots are eaten by cattle.

SAGO.—Sago.—The fecula obtained from the pith of the Sago palms, Metroxylon Sagu (Sagus Rumphii), and Arenga saccharifera (Saguerus Rumphii).

N.O.—Palmeæ.

Habitat.—East Indian and Polynesian Islands.

Characters.—Occurs occasionally as a whitish glistening powder or in irregular grains of variable tint, and distinguished as white and brown sago; but is frequently seen as *pearl-sago* in the form of globular grains, about the size of a pea or less, pearl-like in appearance, with a smooth surface and occasionally showing two or more grains adhering together. The starch granules under the microscope are seen to be irregularly ovate, oval, or elliptical, and often with a roughish surface; the hilum is small and circular and located near one end.

Uses, etc.—As nutrient.

Note.—The tree is felled, split lengthwise, the pith removed, powdered, and washed with water to remove woody tissue. The fecula subsides and constitutes *sago-meal.* This is granulated by passing it when damp through a sieve, the globular pieces dropping into a shallow pot suspended over a fire, where they are dried by constant stirring. A single tree will yield as much as 500 to 600 pounds of sago meal. A sugar, called *jaggary*, is obtained in large quantities from the juice of this tree.

OTHER STARCHES.—The starches are arranged by Allen into five classes, as follows:—(1) THE POTATO GROUP, including *potato starch*, *tous-les-mois* (from CANNA GIGANTEA), and *arrowroot*, Bermuda, St. Vincent and Natal, from the rhizome of MARANTA ARUNDINACEA. (2) THE LEGUMINOUS GROUP, including the starch of the *bean*, *pea*, *lentil*, etc. (3) The WHEAT GROUP, including starches from *wheat* and some other cereals and from certain medicinal plants as *jalap*, *rhubarb*, etc. (4) THE SAGO GROUP, including the starch prepared from the sago palms, various species of SAGUS, *tapioca* (*Cassava starch*, from MANIHOT UTILISSIMA, *N.O.*—Euphorbiaceæ), *arum starch*, and that from many drugs. (5) THE RICE GROUP, including those starches having the smallest grains, viz., that of *rice*, *oats*, *maize*, *ipecacuanha*, etc.

The members of each group have physical characters in common; for particulars of these the student may turn to *Allen's Commercial Analysis.*

Corn-flour.—The so-called Indian corn-flour is prepared from maize; much of the British commodity of this name from rice.

SECTION III.

DRUGS OF ANIMAL ORIGIN.

UNDER this head are included those drugs which consist of whole animals or of animal tissues, animal secretions, etc.

1.—ANIMALS.

CANTHARIS.—Cantharides.—The beetle, Cantharis vesicatoria, dried.

CLASS—INSECTA.

N.O.—Coleoptera.

Syn.—Lytta vesicatoria; Meloë vesicatorius; Spanish flies; Muscæ hispanicæ.

Habitat.—Hungary.

Characters.—From about three-quarters of an inch to an inch long, and a quarter of an inch broad, with two long elytra or wing-sheaths of a shining coppery-green colour, under which are two thin, brownish, transparent membranous wings; odour strong and disagreeable; powder greyish-brown, containing shining green particles.

Collection, etc.—Cantharides is collected in Hungary, France, Spain, Russia and Sicily; the Russian variety being most esteemed. The beetles are usually collected early in the morning, when persons with covered hands and faces shake them off the trees (ash, lilac, privet, etc.), plunge them into vinegar, or expose them in sieves to the vapour of vinegar and then dry them in the sun or in warmed compartments. As they are subject to the ravages of mites and moths (Acarus domesticus and Tinea species, &c.), they should be preserved in well-stoppered bottles containing a little camphor. Both the male and female are official. The green colour of the elytra is said to be due to chlorophyll. In the manufacture of preparations of Cantharides it is better only to bruise the beetles.

Chemistry.—*Cantharidin*, $C_{10}H_{12}O_4$, the active vesicating principle (0·4 to 1 per cent.); green oil; a fatty matter; *osmazome;* free acetic and uric acids and phosphates of calcium and magnesium. Cantharidin is a tasteless, odourless, crystallisable solid, insoluble or only sparingly soluble in water. Cold alcohol dissolves it slightly, but hot alcohol freely. It is soluble in ether and acetic ether, especially when warmed.

Chloroform is its best solvent; acetone being the next. It is soluble in the fixed alkalies and also in strong acetic, sulphuric, and nitric acids with warmth, but it is deposited unchanged from these acids when the solutions are cooled. With the elements of water, cantharidin appears to act as an acid. It may be thus prepared:—Bruise the beetles, and, after removing the fat by means of bisulphide of carbon, exhaust them with chloroform; on evaporation of the chloroform the cantharidin is left in a nearly pure state. It exists in greatest quantities in the genital organs of the insect.

Uses, etc.—Internally as diuretic with powerful irritant action; externally as rubefacient and blistering agent.

B.P. Preparations.

Acetum Cantharidis - -	1 in 10.
Charta Epispastica.	
Emplastrum Calefaciens -	1 part in 24, nearly.
,, Cantharidis -	1 part in 3.
*Liquor Epispasticus - -	1 ounce to 4 fluid ounces.
Tinctura Cantharidis - -	1 in 80 of proof spirit.
Unguentum Cantharidis -	1 part in 8, nearly.

**Used in Preparing*—Collodum Vesicans.

Preparations other than B.P.

Cantharidin, Linimentum Crinale (Squire), Unguentum Stimulans (Erasmus Wilson), etc.

MYLABRIS.—Chinese Cantharides.—The dried insect, Mylabris Cichorii (Chinese blistering fly).

CLASS—INSECTA.

N.O.—Coleoptera.

Habitat.—Southern Europe, extending from Italy, through Greece and Egypt to China. It is of common occurrence throughout India.

Characters.—About one inch long and one-third of an inch broad; the elytra (as is characteristic of the genus) are of an obscure yellow colour, and with three large, somewhat zig-zag, transverse (black) bands. The first band is interrupted and sometimes reduced to three or four spots.

Chemistry.—Contains more than one per cent. of *cantharidin*.

Uses, etc.—As cantharides.

Note.—CANTHARIS VITTATA (the *potato fly*), an insect indigenous to the U.S., has a red head with dark spots, black elytra, with a yellow median stripe and margin. It contains about 1·3 per cent. of cantharidin. CANTHARIS CINEREA (*ash-coloured cantharis*), C. MARGINATA, C. ATRATA (*black cantharis*) are, amongst other species of vesicating beetles, discovered in the United States.

HIRUDO—The Leech.—(1) Sanguisuga medicinalis, the Speckled Leech and (2) Sanguisuga officinalis, the Green Leech.

CLASS—VERMES.

N.O.—Annelida.

Habitat.—South of Europe. Imported from Bordeaux, Lisbon and Hamburg.

Characters.—Body soft, smooth, two or more inches long, tapering to each end, plano-convex, wrinkled transversely; back olive green with six rusty-red longitudinal stripes. (1) Belly greenish-yellow, spotted with black; (2) Belly olive-green, not spotted. The anterior sucker of the leech has a triangular-shaped mouth, with three curved and highly serrated teeth.

Uses, etc.—For drawing blood; a good specimen will remove between 60 and 120 grains.

Note.—Leeches should be preserved in clean soft water in a cool place, and moss, stones, etc., should be provided, in order that the animals may, by passing their bodies through these, remove the slime which would otherwise accumulate. Gorged leeches may be made to yield up the blood by immersion in salt water; they should be kept separately from the others.

COCCUS.—Cochineal.—The dried female insect, Coccus Cacti, reared on Opuntia cochinillifera and other species of Opuntia.

CLASS—INSECTA.

N.O.—Hemiptera.

Syn.—Coccionella, Coccus Cacti.

Habitat.—Mexico, Teneriffe, etc.

Characters and Test.—About one-fifth of an inch long; somewhat oval in outline; flat or concave beneath, convex above, transversely wrinkled, purplish-black or purplish-grey, easily reduced to powder, which is dark red or puce coloured. When macerated in water no insoluble powder is separated. Ignited with free access of air, not much more than one per cent. of ash remains.

Varieties, etc.—There are three varieties known in commerce, viz.:—(1) *Silver-grain*, which is the kind most commonly met with, and which has a silvery appearance, due to the insects being enveloped in a silvery white powder. (2) *Black-grain*, which is dark-brown in colour, with traces of the white powder. (3) *Granilla*, an inferior kind, made up of small and imperfect insects. The difference between the silver and black-grain is said to be due to the mode adopted of destroying the insects—a dry heat being used for the former and boiling water for the latter.

Note.—Cochineal insects are reared on the *nopal*, OPUNTIA COCHINILLIFERA (*N.O.*—Cactaceæ), a plant with flattened elliptical branches. The impregnated females are placed on this plant, and they there deposit their young. After a few months, when the females are fecundated, they are brushed off, killed, and then dried. Three harvests are annually gathered—the female alone being collected. Of the two commercial kinds, black-grain and silver-grain, the former are now considered to be the better. The male insect is about half the size of the female, its body terminating posteriorly in two long divergent setæ. When macerated in water, the insect swells up considerably, and its shape and three pair of legs become visible. Seventy thousand insects go to make one pound of cochineal.

Chemistry.—*Carminic acid*, $C_{17}H_{18}O_{10}$ (the colouring principle, also known as *cochinillin* or *coccionellin*), is the most important constituent. There are also present water, nitrogenous matter, fat and wax (*coccerin*, myristin, etc.) and ash. Carminic acid is a glucoside, breaking up on hydrolysis into *carmine-red* and a sugar.

Uses, etc.—As colouring agent; also largely in the arts.

B.P. Preparations.

Tinctura Cardamomæ Composita	1 in 160, about.
Tinctura Cinchonæ Composita	1 in 320, about.
Tinctura Cocci	1 in 8 of proof spirit.

Carmine.—Is prepared by precipitating decoction of cochineal with alum, a salt of tin, gelatin, etc. It consists, therefore, of carminic acid with nitrogenous and mineral matters. It is slightly soluble in water, readily in alkaline liquids, ammonia being commonly used for the purpose.

Adulterations of Cochineal.—Such white and heavy powders as barium sulphate, powdered talc and lead carbonate fixed on the insects with gum to increase their weight, have been used; and bone black and charcoal, similarly fixed, have been used to render the black variety heavier. The drug may be valued (according to Thorpe) by noting the quantity of standard, neutral, alum solution required to completely precipitate the colouring matter.

2. ALBUMINOUS SUBSTANCES.

THE type of this class is the albumin found in white of egg. All the albuminoids contain the five elements—carbon, oxygen, hydrogen, nitrogen and sulphur, differing from one another but little in percentage composition. Many of them *coagulate* when heated, and are precipitated from solution by alcohol, nitric and acetic acids, most metallic salts and other reagents. On incineration they usually leave a trace of ash containing phosphates and other salts. The albuminoids are divided into a number of groups, including the *albumins*, *globulins*, *peptones*, etc.

OVI ALBUMEN.—Egg Albumen.—The liquid white of the egg of Gallus Bankiva *var.* domesticus.

CLASS—AVES.

N.O.—Gallinæ.

Characters.—A glairy viscid fluid contained in delicate membranous cells. It is soluble in water, and the aqueous solution is coagulated when heated to about 70° C., the coagulum being no longer soluble in water.

Chemistry.—White of egg contains albumins (*egg-albumin*, etc.) amounting to about 12 per cent., in addition to water (83 per cent.), mucus and traces of other substances. Egg-albumin may be obtained from white of egg by diluting with water, filtering, and adding basic acetate of lead; the precipitate of albumin formed is subsequently treated with carbon dioxide and sulphuretted hydrogen, which remove the lead, leaving the albumin in solution. This solution is now evaporated at 50° C., leaving a white or pale-yellow, brittle and friable, translucent mass. Dried albumin is soluble in water, more readily so if alkali be present. Its aqueous solution is coagulated when heated to about 70° C. Albumin is insoluble in alcohol and ether and is precipitated from solution by nitric and hydrochloric acids, phenol and many metallic salts. It is not precipitated by acetic, carbonic or phosphoric acids. By the action of gastric juices, pepsin and other ferments, albumin is converted into *peptone*, which is soluble in water and incoagulable by heat.

Uses, etc.—For clarifying liquids, and as antidote to many mineral poisons.

OVI VITELLUS.—Yolk of Egg.—The yolk of the egg of Gallus Bankiva *var.* domestica.

CLASS—AVES.

N.O.—Gallinæ.

Characters.—A yellow thick liquid, separated in the egg from the white by a delicate membrane. When agitated with water it forms a yellowish milky emulsion. When heated it is converted into a granular solid.

Chemistry.—*Vitellin* (about 15 per cent.); fat (about 20 per cent.); cholesterin, lecithin, water, colouring matter, salts. Vitellin is an albuminoid belonging to the class of globulins and may be obtained as a residue after treating yolk of egg with water, alcohol and ether; it is insoluble in water but soluble in dilute acids and alkalis and in a 10 per cent. solution of common salt.

Uses, etc.—In the preparation of emulsions; as nutrient, etc.

B.P. Preparation.

Mistura Spiritus Vini Gallici.

Serum albumin (*blood albumin*) is obtained by separating the clot *(fibrin)* of blood from the liquid portion *(serum)*. Both in the liquid condition and reduced to a powder by evaporation, blood serum has been used in medicine as a remedy for anæmia, debility, etc.

Antitoxic Serums consist of the defibrinated blood of animals rendered immune from various diseases by inoculation with the bacilli causing them. The *Antidiphtheritic Serum (diphtheria antitoxin)* is prepared as follows:—A nutrient material consisting of beef broth is prepared, and to this (contained in a flask of special design) is added a small quantity of a pure bouillon culture of the diphtheria bacillus, the necessary material for the latter being obtained from a patient suffering from the disease. The flask containing the culture and nutrient liquid is kept in an incubator for a period of about one month, moist air being during that time passed continuously through the flask. A sufficient quantity of toxin having now been formed, the bacilli are destroyed by the addition of one-half per cent. of carbolic acid or are removed by filtration. The poison-containing fluid is now injected in gradually augmented doses into the veins of horses kept specially for the purpose, and, when the animals are thought to have been by this means rendered sufficiently immune, they are bled. The blood is allowed to coagulate, and the serum, a pale straw-coloured fluid, is preserved by the addition of carbolic acid or camphor and stored in small phials. It may also be evaporated to dryness in vacuo, without suffering decomposition, and used in this form. Serums, for the treatment of cancer, of syphilis, and of snake bite, are prepared on similar lines.

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3. GLANDS, GLANDULAR SECRETIONS, ANIMAL EXTRACTS, Etc.

MOSCHUS.—Musk.—The dried secretion from the preputial follicles of Moschus moschiferus.

CLASS—MAMMALIA.

N.O.—Ruminantia.

Habitat of the Animal.—Native of the mountainous regions of Central Asia. Musk is imported from China and India.

Characters and Test.—In irregular, somewhat unctuous grains of a dark reddish-brown or reddish-black colour, a very strong, peculiar, diffusible, penetrating, persistent odour and a bitterish taste; contained in a roundish or oval sac, from about one and a half to two inches in diameter, which is nearly smooth on one side, and covered on the other or outer side by brownish-yellow or greyish adpressed bristle-like hairs, concentrically arranged around a nearly central orifice. It should be free from earthy impurities.

Chemistry.—Stearin, olein, cholesterin, albumin, and free ammonia are present and may be easily separated. The odoriferous principle has not been isolated; it is attached to the ammonia, and is dissipated by heat. The ash should not exceed eight per cent.

Uses, etc.—As stimulant and antispasmodic. *Dose.*—5-10 grains. Largely also in perfumery. The U.S.P. includes a tincture, 1 in 10.

Varieties and Adulterations.—There are two varieties, viz., *Chinese* or *Thibet musk* and *Russian* or *Siberian musk*, of these the former is considered more valuable. *American musk* is a substitute obtained from the *musk rat* (FIBER ZIBETHICUS). This amphibious animal is related to the beaver, and abounds on the margins of the rivers and lakes in the United States and Canada. Its follicles are of a flattened oval shape, a brown colour, and smell strongly of musk and rancid fat. It has been suggested to abstract the musk-like odour from the follicles (washing them first with ether) by means of rectified spirit, with the addition of a little water and a few drops of solution of ammonia. Musk is largely adulterated, and an artificial musk is extensively manufactured by the Chinese merchants of Canton. It is said to be composed of a mixture of dried blood and ammonia, together with a small quantity of musk, the whole being enclosed in a piece of the skin of the animal. The genuine drug should be contained in sacs answering to the official characters, and these should show no evidence of having been opened and subsequently sewed or glued up.

Note.—*Civet* is an odorous substance obtained from the perineal glands of the civet cat (VIVERRA CIVETTA) and other species of Viverra. It is imported from Africa and the West Indies and has similar properties to musk and castor, but is used almost exclusively in perfumery.

CASTOREUM.—Castor.—The dried preputial follicles and their secretion, obtained from the Beaver, Castor Fiber, and separated from the somewhat shorter and smaller oil-sacs which are frequently attached to them.

CLASS—MAMMALIA.

N.O.—Rodentia.

Habitat.—Hudson's Bay Territory.

Characters.—Follicles in pairs, about three inches long, fig-shaped, firm, and heavy, brown or greyish; containing a dry resinous reddish-brown or brown, highly odorous secretion, in great part soluble in rectified spirit, and in ether.

Chemistry.—*Castorin*, a crystalline, fatty, non-saponifiable substance; volatile oil (1 to 2 per cent,); a bitter resin; with fatty (cholesterin, etc.) albuminous and saline matters, mixed with epithelial débris; also traces of salicin, benzoic and carbolic acids are present.

Uses, etc.—As stimulant and antispasmodic. *Dose.*—5 to 10 grains. Formerly official in the B.P. for the preparation of a tincture, 1 in 20 of S.V.R.

Note.—The castor sacs are found both in the male and female. They must not be confounded with the testicles of the male genital organs. Of the two commercial varieties, *Canadian* and *Russian*, the latter contains more castorin. Real sacs, emptied of their natural contents and stuffed with hay, have been met with as adulterations.

PEPSIN.—Pepsin.—A preparation of the fresh and healthy stomach of the pig, sheep or calf. It may be prepared as follows :—

The stomach of one of these animals, recently killed, having been cut open and laid on a board with the inner surface upwards, any adhering portions of food, dirt, or other impurity are to be removed, and the exposed surface slightly and rapidly washed with a little cold water ; the cleansed mucous membrane is then to be scraped with a blunt knife or other suitable instrument, with some pressure, and the viscid pulp thus obtained is to be immediately spread over the surface of glass or glazed earthenware, and quickly dried at a temperature not exceeding 100° F. (37·8°C). The dried residue it to be reduced to powder and preserved in a stoppered bottle.

Characters and Tests.—A light yellowish-brown powder, having a faint but not disagreeable odour and a slight saline taste, without any indication of putrescence. Very little soluble in water or spirit. Two grains of it with an ounce of distilled water, to which five minims of hydrochloric acid have been added, form a mixture in which at least 100 grains of hard-boiled white of egg, passed through wire gauze of 36 meshes per linear inch and made of No. 32 brass or copper wire, will dissolve on their being well mixed, digested and well stirred together for 30 minutes at a temperature of 130° F. (54°·4 C.)

Chemistry.—Pepsin contains a soluble proteolytic ferment or enzyme, so called on account on account of its property, in the presence of dilute acids, of converting albumins (proteids) into soluble peptone. Pepsin, made according to the B.P. method, contains, in addition to the ferment, peptone and other nitrogenous matters derived from the gastric juice.

Uses, etc.—In impaired digestion, etc. *Dose.*—2-5 grains. Also used in solution as *liquor pepticus*, etc.

Varieties of Pepsin.—The B.P. product belongs to the class of insoluble pepsins, and is less active than the soluble varieties (e.g., *Pepsinum*, U.S.P.) which are prepared in the form of a fine yellowish-white powder or scales by removing the soluble part of the peptic glands and evaporating at a low temperature. The U.S.P. gives an elaborate method for the assay of pepsin, involving a six hours' digestion.

Pepsinum Saccharatum, U.S.P., consists of pepsin diluted with nine times its weight of lactose. Pepsin was first made by *Boudault's* method, viz. :—The aqueous extract obtained from the stomach was precipitated with acetate of lead, the precipitate washed, suspended in water, the lead thrown down by hydrogen sulphide, and the liquid, after filtration, evaporated to a syrupy consistence and mixed with starch.

Rennet is the name given to the specially prepared fourth or true digesting stomach of the calf; it is used for curdling milk. *Liquid rennet, essence of rennet*, etc., are obtained by treating fresh rennet with suitable solvents.

Papain (*Papayotin*) is a powder obtained from the juice of CARICA PAPAYA (the *papaw*), an American tree. It contains a digestive ferment which acts in neutral or alkaline solution, and is given in cases of impaired digestion (*dose*—2-10 grains); it is also used in the removal of warts, etc.

Pancreatin is a mixture of the enzymes (ferments) naturally existing in the pancreas of warm-blooded animals; usually obtained from the fresh pancreas of the hog. The action of the pancreas is fourfold, viz.:—(1) Peptonising (due to presence of *trypsin*); (2) milk-curdling (like rennet); (3) diastatic (due to presence of the ferment *amylopsin*); (4) fat-emulsifying (due to the ferment *steapsin*). These act only in neutral or alkaline solutions. *Pancreatin, Pancreatine, Liquor Pancreaticus* are different preparations of the pancreas, and they find use chiefly for mixing with foods, such as milk, starchy meals, fats, etc., which are thus rendered more digestible.

Ingluvin is an American preparation of, it is said, the gizzard of fowls. To it has been attributed a digestive action similar to that of pepsin, but this statement lacks confirmation.

LAC.—Milk.—The fresh milk of the Cow, Bos Taurus.

CLASS—MAMMALIA.

N.O.—Ruminantia.

Characters.—A limpid, opaque-white liquid with a sweet taste and faint peculiar odour. S.G. about 1·030. Separating, on standing, into two layers, the upper of which constitutes about one-tenth by volume and is known as cream.

Chemistry.—Milk contains about twelve per cent. of solid matter, the remainder being water. The solid matter consists of *butterfat, albumin* (*casein*, etc.), sugar of milk (*lactose*) and various salts. By treatment with acids, preparations of rennet and other ferments, milk is divided into two portions, a liquid *whey* holding the lactose and salts in solution and a more or less solid portion, the *curds*, which consists essentially of the casein. The following table gives the average percentage composition of various kinds of milk.

	Water.	Solids.	Fat.	Lactose.	Casein.	Salts.
Woman	88·6	11·4	3·5	5·0	2·7	0·2
Cow	87·5	12·5	3·8	3·8	4·2	0·7
Ass	92·0	8·0	1·3	4·5	1·7	0·5
Ewe	85·6	14·4	4·5	4·2	5·7	Included in the sugar and casein.
Goat	82·0	18·0	4·5	4·5	9·0	

Milk containing less than three per cent. of fat and eight and a half per cent. of non-fatty solids is liable to suspicion of having had fat removed or water added.

Artificial Human Milk is prepared from cow's milk by reducing (by dilution with water or other means) the amount of casein present, and adding milk sugar.

Koumiss is a fermented mare's milk prepared by the natives of Siberia, and introduced also into this country. The fermentation is thought to render the milk more easy of digestion, and to give it medicinal properties.

Kephir is a liquid similar to koumiss prepared in the Caucasus.

Condensed Milk is prepared by evaporating milk to which sugar has been added to a thick syrupy consistence. The inferior kinds have the fat removed and hence when diluted are in no way representative of whole milk.

FEL BOVINUM PURIFICATUM.—**Purified Ox Bile.**—The purified gall of the Ox, Bos Taurus.

CLASS—MAMMALIA.

N.O.—Ruminantia.

Take of fresh ox bile one pint, rectified spirit a sufficiency, evaporate the bile to five fluid ounces and mix it with half a pint of the spirit by agitation in a bottle, setting the mixture aside for twelve hours or until the sediment subsides. Decant the clear solution and filter the contents with a little more of the spirit. Distil off most of the spirit from the mixed liquids and evaporate the residue in a porcelain dish by the heat of a water-bath until it acquires a suitable consistence for forming pills.

Characters and Tests.—A yellowish-green substance, having a taste partly sweet and partly bitter, soluble in water and in spirit. A solution of one or two grains of it, in about a fluid drachm of water, when treated, first with a drop of freshly made syrup consisting of one part of sugar and four of water, and then with sulphuric acid cautiously added until the precipitate at first formed is redissolved, gradually acquires a cherry-red colour, which changes in succession to carmine, purple and violet. Its watery solution gives no precipitate on the addition of rectified spirit.

Chemistry.—Ox gall contains several so-called "gall-acids" and "gall pigments." The former are present as sodium salts, and the most important are *glycocholic* and *taurocholic acids*, but, in addition, there are present *hyoglycocholic* and *hyotaurocholic acids.* The bile-pigments present are *bilirubin*, *biliviridin*, etc. The remainder consists of cholesterine, choline, urea, fat and inorganic salts.

Uses, etc.—As tonic and laxative. *Dose.*—5-10 grains in pills, etc.

FEL BOVIS (*Ox Gall*), U.S.P.—The fresh gall of Bos Taurus. *Characters.*—A brownish-green or dark-green, somewhat viscid, liquid, having a peculiar odour, a disagreeable, bitter taste and a neutral or faintly alkaline reaction. S.G. 1·018 to 1·028. When heated to about 80° C., coagulation of albuminous principles takes place. *Chemistry.*—It yields, on evaporation, nine per cent. of solid residue of a fatty nature and waxy consistence. After coagulation and filtration the solution is clear, and gives all the characteristic reactions described under "Purified Ox Bile."

GELATINUM.—**Gelatine.**—The air-dried product of the action of boiling water on gelatinous animal tissues, such as skin, tendons, ligaments and bones.

Characters.—In translucent sheets or shreds. The solution, in hot water, is colourless and inodorous and solidifies to a jelly on cooling. Gelatine is insoluble in alcohol and ether. It dissolves in acetic acid. Its aqueous solution is not precipitated by diluted acids, alum, acetate of lead or perchloride of iron ; it is precipitated by tannin.

Chemistry.—Gelatine differs in composition from the albumins in containing no sulphur, and having a slightly larger proportion of nitrogen ; unlike these also, its aqueous solution is not precipitated by acids nor by heat.

Uses, etc.—As basis for suppositories, in pill-coating, capsule making, etc.

B.P. Preparation.
Suppositoria Glycerini.

Note.—Gelatine is chiefly obtained by high-pressure steam from calves' pelt, tendons, ligaments, skins, bones, etc.; the solution thus obtained is spread upon plates, dried, and sold in sheets or cut up into shreds. *Glue* is an impure variety of gelatine made from the trimmings of hides. *Size* is glue of an inferior tenacity and softer consistence, and is prepared from the parings of parchment and thin skins.

Keratin is an extract obtained from horn-turnings, feathers, etc., by treating them first with pepsin (in acid solution) and subsequently with ammonia or glacial acetic acid. By evaporation of the solution a viscid liquid is obtained which is used for coating pills. Pills coated in this way are supposed to pass through the stomach unchanged and dissolve in the small intestine.

ICHTHYOCOLLA.—Isinglass.—The swimming bladder or sound of various species of Acipenser, prepared, and cut into fine shread; obtained chiefly from Acipenser Huso (the Beluga) and other species of the Sturgeon, as Acipenser Sturio (the Common Sturgeon). Other genera, as Silurus, Morrhua, Gadus, Otolithus, Lota, and Polynemus, also yield isinglass.

CLASS—PISCES.

N.O.—Sturiones, etc.

Characters.—In separate sheets, sometimes rolled, of a horny or pearly appearance; whitish or yellowish, semi-transparent or irridiscent, inodorous, insipid ; almost entirely soluble in boiling water and in boiling diluted alcohol.

Note.—The organ from which isinglass is obtained is a membranous sac, filled with air, and found under the spine in the middle of the back above the centre of gravity. According to the mode of preparation, isinglass passes under the names of *purse, pipe, lump, leaf, honeycomb, staple, book* and *ribbon isinglass.* Besides the Russian variety (which is considered to be the best) there are Brazilian and East India kinds. Fifteen grains of isinglass will render one ounce of water jelly-like.

Chemistry.—Gelatine (90 per cent.) ; albumin (8 per cent.) ; membrane, insoluble in boiling water ; with salts of potassium and sodium, and a little phosphate of calcium.

Uses, etc.—As nutrient, etc. ; included in the U.S.P. for making court plaster.

GLANDULA THYROIDEA.—Thyroid Gland.—The recently removed thyroid gland of the sheep, Ovis Aries, freed from enveloping tissues.

CLASS—MAMMALIA.

N.O.—Ruminantia.

Characters.—Two-lobed, the lobes oblong or almond-shaped, one to one and a half inches in length, and about three-quarters of an inch broad. Colour, dark-red.

Chemistry.—The active principle of the gland has not yet been isolated ; thyroid extract consists chiefly of an albumin coagulating when heated to 70° C. and precipitated by solution of magnesium sulphate.

Uses, etc.—In the treatment of myxœdema, goitre, lupus and other skin affections. Given in the form of fresh gland, dried gland, glycerine extract, aqueo-alcoholic extract.

Note.—Supra-renal glands of the sheep in the form of glycerine extract are also used in medicine.

Animal Extracts.—The number of these is on the increase and preparations of the heart (*cardin*); of the brain and spinal cord (*cerebrin, medullin*); of the testicles (*spermin, orchidin, testiculin*); of the spleen; of the thymus gland; of the pituitary body and others, are met with in medicine.

ICHTHYOL.—Ichthyol.

Syn.—Ammonium ichthyol-sulphonate, sulpho-icththyolate of ammonium.

To obtain ichthyol, a tarry liquid distilled from certain bituminous deposits containing fossil fish (found in the Tyrol) is treated with sulphuric acid and the resulting compound neutralized with ammonia.

Characters.—A reddish-brown viscid liquid of bituminous taste and odour. On incineration it yields no residue; soluble in water and in a mixture of alcohol and ether; treated with potash it evolves ammonia; heated on the water-bath it loses half its weight.

Chemistry.—Probably contains pyridine, etc.; sulphur is present to the extent of about ten per cent.

Uses, etc.—Internally and externally in skin diseases. *Dose.*—15-30 grains in pills. Given externally in the form of ointments, paints, etc.

Note.—Substances similar to the ammonium compound are made with soda, zinc, lithium, etc. *Thiol* is a similar compound made by treating gas tar with sulphuric acid.

4.—MISCELLANEOUS ANIMAL SUBSTANCES.

OS.—Bone.—The substance forming the skeletons of vertebrated animals.

Chemistry.—Bones consist of an organic portion (*ossein*) which, on prolonged boiling with water, yields gelatine and a large proportion (40-60 per cent,) of mineral salts, consisting largely of calcium phosphate with calcium carbonate.

Uses, etc.—For preparing animal charcoal and bone ash (*os ustum*), from which phosphates are prepared. Artificial manures (superphosphate, etc.) are prepared by treating ground bones with sulphuric acid.

OS SEPIÆ.—Cuttle-Fish Bone.—The calcareous growth in the mantle of the common cuttle-fish, Sepia officinalis.

CLASS—MOLLUSCA.

N.O.—Cephalopoda.

Habitat.—Shores of the Mediterranean Sea and Australia.

Characters, etc.—The oval or oblong calcareous "bone" is deposited in the mantle of the animal. It has a cellular texture and floats on water. S.G. 0·935. It is from three to ten inches long, and its breadth is about one-third of its length; it is hard upon its upper surface and edges, but soft on its lower side, both surfaces being convex. The layers of the calcium salt are arranged in such a way as to resemble a miniature Giant's Causeway.

Chemistry.—It consists mainly of calcium carbonate (80 to 85 per cent.); gelatine (four to nine per cent.); water (four per cent.) Its composition is therefore different from that of bone.

Uses, etc.—In making dentifrices, etc.

Note.—Testa preparata.—Oyster shells, either cleaned and powdered or burned, have been used in medicine for purposes similar to those of chalk, of which they contain about 90 per cent.

SPONGIA.—Sponge.—The soft, elastic skeleton of Spongia officinalis.

CLASS—PORIFERA.

N.O.—Ceratospongia.

Characters.—Masses of ramifying and anastomosing tissue traversed by numerous canals and pores, and during life clothed with a gelatinous envelope, having numerous small mouths on its surface.

Varieties, etc.—The best sponges comes from the Mediterranean and Red Seas and are known as Turkey Sponges; inferior kinds from the W. Indies. They are collected by divers who remove them from the sub-marine rocks to which during life they adhere. The gelatinous flesh is removed by burying the sponges, and, as found in commerce, they frequently contain large quantities of sand.

Chemistry.—Sponges consist largely of an albuminoid substance known as *spongin*, which is soluble in hot alkalies and mineral acids. The ash contains iodine and bromine

Uses, etc.—For bathing, etc.; also for making surgical "tents" and "compresses." Burnt sponge (*spongia usta*) was formerly official in some of the Pharmacopœias: it was obtained by partially burning the sponge and owed its value as a medicine to the presence in it of sodium iodide.

ADDENDA.

LACTUCARIUM.—Lactucarium.—The inspissated, bitter, milky juice contained in the proper laticiferous vessels of the leaves and stems of Lactuca Virosa; obtained by incision.

N.O.—Compositæ.

Syn.—Lettuce Opium.

Habitat.—Great Britain; cultivated.

Characters.—In sections of plano-convex circular cakes, or in irregular angular pieces, externally greyish-brown or dull reddish-brown, internally whitish or yellowish, of a waxy lustre; odour heavy, somewhat narcotic; taste bitter.

It is partly soluble in alcohol and in ether. When treated with water it yields a turbid mixture, and when boiled with water it softens and yields a brownish-coloured liquid which, after cooling, is not coloured blue by iodine test solution.

Chemistry.—*Lactucerin* (*lactucone*), 50-60 per cent., colourless and tasteless, insoluble in water, soluble in alcohol and in ether; *lactucin*, crystalline, bitter, soluble in 60 parts of cold water; *lactucic acid*, bright-yellow, amorphous, coloured red by alkalies, precipitated by lead acetate; *lactucopicrin*, soluble in alcohol, not precipitated by lead acetate solution.

Uses, etc.—As reputed sedative and hypnotic. *Dose.*—2-5 grains. Official in the U.S.P., which also includes a tincture.

Note.—French Lactucarium (Thridace) is an extract of the plant.

PICROTOXINUM.—Picrotoxin.—Obtainable from the seeds of Anamirta paniculata, by exhaustion with alcohol, evaporation and purification. *(See Cocculus Indicus.)*

Characters and Tests.—Colourless and inodorous prismatic crystals, possessing a bitter taste. It melts at 378° F. (192·2° C.) It is soluble in three hundred and thirty parts of cold water, leaving only a trace of residue, in thirty-five parts of boiling water, also in three of boiling and thirteen of cold rectified spirit. It is soluble in ten parts of solution of potash, and the resulting liquid, on boiling, immediately reduces Fehling's solution. Heated on platinum foil the crystals melt, forming a yellowish liquid, which, by further heating, chars, and is at length completely dissipated. Its aqueous solution is not precipitated by solutions of perchloride of mercury, perchloride of platinum or tannic acid. It dissolves in sulphuric acid, with a saffron-yellow colour.

Chemistry.—$C_{15}H_{16}O_6 + H_2O$.

Uses, etc.—In epilepsy; for controlling night-sweats, etc. *Dose.*—$\frac{1}{100}$ to $\frac{1}{30}$ grain.

Glossary of Botanical Terms commonly made use of in describing Vegetable Materia Medica.

[*In compiling this List large use has been made of the Glossaries contained in the works of M. C. Cooke, Asa Gray and C. C. Babington; indebtedness to all of these is hereby acknowledged.*]

Abnormal, departing from the natural order of things.
Abruptly-pinnate, said of a pinnate leaf terminating with a pair of leaflets.
Acaulescent, **Acauline**, stemless.
Achænium, small, dry, indehiscent fruit, one-celled and one-seeded.
Achlamydeous, without floral envelopes.
Acicular, needle-shaped.
Acotyledonous, without cotyledons.
Acuminate, pointed.
Acute, sharp-pointed.
Adnate, grown to another portion.
Adpressed, in close contact, but not adherent.
Adventitious, developed in an unusual position.
Æstivation, the disposition of folds in flower-buds.
Agglomerate, heaped up or crowded together.
Agglutinate, glued together.
Aggregate, collected together.
Albumen, a nutritive substance found in seeds surrounding the embryo.
Albuminous, furnished with albumin.
Alburnum, sap-wood of an exogenous tree.
Alliaceous, pertaining to the *allium* or garlic family: smelling like garlic
Alternately-pinnate, having the leaflets of a pinnate leaf alternately inserted on the petiole.
Amentum, a scaly spike or catkin.
Amphitropous, applied to an embryo with hilum between micropyle and chalaza.
Amplexicaul, embracing the stem.
Amylaceous, starchy.
Anastomosis, connection of cross veins by means of branches.
Anatropous, of an ovule, with the micropyle close to the hilum.
Andrœcium, the male organs of a flower.
Angiocarpous, having the fruit covered by an envelope.
Angiospermous, with the seeds inclosed in a pericarp.
Angular, with projecting angles (said of leaves and stems).
Annual, lasting one year.
Annular, having the form of a ring.
Annulate, marked with rings.
Anther, the pollen-bearing part of a stamen.
Anthocarpous, said of a fruit resulting from many flowers.
Apetalous, without petals.

Apex, the opposite extremity to the point of attachment.

Apothecia, the "shields" of lichens bearing the fructification.

Appendage, a part superadded or subsidiary.

Aril, an extension of the placenta encompassing the seed, as the mace of the nutmeg.

Arillate, possessing an aril.

Arillode, a false aril originating from the micropylar region of the seed.

Articulated, jointed, separating freely.

Asci, spore-cases ; imbedded sacs containing spores.

Auriculate, having a pair of lobes or ear-shaped appendages.

Awn, a bristle-shaped appendage, *e.g.*, beard of barley.

Axil, the angle between the stem and leaf.

Axillary, growing in the axils.

B.

Bacca, an indehiscent pulpy fruit resulting from an inferior ovary.

Balausta, the fruit of the pomegranate.

Bark, the integument of the stems of exogens.

Bi-cornute, with two horn-like processes.

Biennial, growing one year, flowering and fruiting the succeeding.

Bi-furcate, doubly forked.

Bracts, leaves (generally modified in form) growing in connection with the flowers.

Bulb, modified leaf-bud, with fleshy scales generally upon, or partly immersed in, the soil.

Bulb, tunicated, a bulb with thin membraneous scales, forming successive coats.

C.

Caducous, dropping off very early.

Calcarate, spurred.

Calceolate, having the form of a slipper.

Calyx, the external whorl of the floral envelope.

Cambium, the formative layer found between the wood and bark of exogens.

Campanulate, bell-shaped.

Campylotropous, said of an ovule so bent that the apex is brought to the hilum, but the two portions are of unequal length.

Capitulum, the inflorescence of flowers of the *N.O.* Compositæ.

Capsule, a dry dehiscent multi-carpellary seed-vessel or fruit.

Cariopsis, a dry one-seeded indehiscent fruit, with the endocarp adherent to the spermoderm.

Carpel, one of the modified leaves composing or being a pistil.

Catkin, a scaly spike of unisexual flowers.

Cauline, belonging to the stem.

Cellular, composed of cells.

Cellulose, the material of which cell-walls consist.

Chalaza, in a seed, where the nucleus joins the integuments.

Channelled, hollowed out like a gutter.

Circumscription, the outline of a leaf or other organ.

Coccus, one of the parts into which a lobed fruit splits up.

Convolute, rolled up longitudinally.

Cordate, heart-shaped—applied to leaves.

Cordate-hastate
Cordate-saggitate } Partly cordate with the other characters.
Cordate-ovate

Coriaceus, of a leathery texture.

Corm, a swollen, succulent stem or base of a stem.

Corneous, horny in texture.

Corolla, the inner whorl of the floral envelope.

Cortex, the bark.

Corymb, a centripetal inflorescence in which the pedicels originate at different heights on the axis, but elevate all the flowers to nearly the same level.
Corymbose, resembling a corymb.
Cotyledons, rudimentary or seed-leaves of an embryo.
Cremocarp, a fruit of two one-seeded carpels (mericarps), which, when ripe, separate and are suspended from a carpophore, as in Umbellifers.
Crenate, with convex teeth—applied to the margins of leaves.
Crenulate, diminutive of *crenate*.
Cryptogamia, plants having no evident or true flowers.
Culm, the straw or stem of grasses.
Cuneate, wedge-shaped.
Cyme, an inflorescence developed in a centrifugal manner.
Cypsela, a one-seeded indehiscent, inferior fruit, resulting from a unilocular ovary, generally surmounted by the remains of the calyx.

D

Deciduous, applied to plants the leaves of which are shed annually.
Decompound, having compound divisions.
Decorticate, deprived of the bark or cortical layer.
Dehiscence, splitting into regular parts.
Dentate, toothed.
Denticulate (diminutive), having small teeth.
Dichotomous, forked or furcate in pairs.
Dicoccous, splitting into two cocci.
Dicotyledonous, having two cotyledons.
Digitate, having several leaflets radiating from the apex of the leaf-stalk.
Digitate-pinnate, said of a digitate leaf with pinnate leaflets.
Diœcious, having unisexual staminiferous flowers borne on one plant, pistilliferous on another.
Disk, any organ between the stamens and ovary—a development of the torus.
Dissepiment, partition of, *e.g.*, a fruit.
Drupe, succulent or fleshy fruit, with a hard-shelled seed or stone.
Drupel, a little drupe.
Duramen, heartwood of exogenous trees.

E.

Emarginate, having a notch at the extremity.
Embryo, rudimentary plantlet within its seed.
Endocarp, lining of a carpel. Inner layer of pericarp.
Endogenous, growing by additions to the centre.
Endophlœum, inner layer of bark. The liber.
Endopleura, the innermost skin of a seed-coat.
Entire, having no marginal divisions or serratures.
Epicarp, the outer layer of a pericarp.
Epidermis, the true skin of plants.
Epigynous, growing or appearing to grow upon the ovary.
Epipetalous, growing upon the petals.
Epiphlœum, the outer layer of bark.
Epiphytic, growing upon another plant.
Etærio, a fruit composed of agglomerated drupes.
Exalbuminous, without albumin, said of a seed in which the albumin is contained in the embryo.
Exogenous, growing by additions to the outside of the stem, said of dicotyledons.

F.

Falcate, sickle-shaped.
Farinaceous, with the texture of flour.
Fascicled, Fasciculated, in bundles proceeding from a common point.
Fastigiate, nearly parallel, pointing upwards.

Feather-veined, where the primary veins are nearly straight, parallel, and run to the margin.
Ferruginous, rust-coloured.
Fibro-vascular, consisting of woody vessels and fibres.
Florets, the small flowers collected into a head in composite plants.
Foliaceous, having the form or texture of a leaf.
Follicle, a fruit of one carpel, dehiscing by the ventral suture.
Foramen, the aperture in the integuments of an ovule.
Fornicate, arched.
Frond, combination of leaf and stem ; the leaf-like expansion of Ferns. Algæ, etc.
Fruticose, shrub-like.
Fugacious, falling off rapidly.
Funiculus, thread connecting the ovule or seed with placenta.
Fusiform, spindle-shaped.

G.

Galbulus, a modification of the strobilus with enlarged or fleshy scales.
Gall, a pathological growth produced by the puncture of an insect.
Gamopetalous, with the petals united.
Gamosepalous, with the sepals united.
Germination, the first development of an embryo.
Gibbous, having pouches or convex swellings.
Glabrous, destitute of hairs, smooth.
Glans, an indehiscent fruit seated in a cupule.
Glaucous, Glaucescent, covered with a bloom of a bluish-green tinge.
Glume, the chaff-like scale of the flower of grasses.
Gymnosperms, plants having naked seeds.
Gynandrous, having stamens and pistil united into one body
Gynœcium, the pistil and its appendages.
Gynophore, a pedicellary support to the ovary.

H.

Habitat, the situation of a plant in its wild state.
Hastate, halbert-shaped, applied to leaves
Hermaphrodite, of both sexes, having both stamens and pistil.
Hesperidium, a fruit of the orange kind.
Hilum, scar left by the separation of seed from its placenta.
Hispid, covered with long stiff hairs.
Histology, that branch of biology which treats of animal and vegetable tissues.
Hypogynous, growing from beneath the ovary.

I.

Imbricate, overlapped, like the tiles of a house.
Imparipinnate, said of a pinnate leaf terminated by a single leaflet.
Incomplete, destitute of some organ normally present.
Incumbent, applied to an embryo when its radicle is folded upon the back of the cotyledons.
Indehiscent, not splitting when ripe (applied to fruits).
Indusium, the involucre or covering of the fructification of ferns.
Inferior, growing below, as when one organ is below another.
Inflorescence, the mode of disposition of flowers upon the stem.
Intercellular, between cells.
Internode, the space between two nodes.
Introrse, turned towards the axis.
Involute, with the edges rolled inwards.
Irregular, flowers are said to be irregular when there is a lack of symmetry in their parts.

L.

Labiate, lipped, said of a monopetalous corolla, with two unequal divisions.
Labium, the lower lip of a labiate flower.
Lactiferous, milk-bearing.
Lamina, the blade of a leaf.
Lanceolate, having the form of a lance-head ; elliptical, tapering to both ends.
Latex, the viscid fluid contained in laticiferous vessels.
Laticiferous Vessels, anastomosing tubes, contaning the latex.
Legume, a dehiscent two-valved carpel, bearing seeds on the ventral suture.
Lenticels, small lens-shaped spots on young bark.
Liber, the inner layer of the bark of Exogens.
Ligula, one of the strap-shaped florets of the ray of Composites.
Limb, the upper expanded portion of a petal.
Linear, with parallel sides.
Lobe, a rounded portion of a leaf or petal.
Locellus, a secondary cell.
Loculicidal, dehiscing through the dorsal sutures of the carpels.
Lyrate, pinnatifid, with the upper lobes largest.

M.

Medulla, the pith or central column of Exogens.
Medullary Rays, cellular plates passing from the medulla to the pith in exogenous stems.
Mericarp, one of the carpels of the fruit of an umbellifer.
Mesocarp, the middle or intermediate layer of a pericarp.
Mesophlœum, the middle layer of the bark, between the liber and epiphlœum.
Mesophyllum, all the cellular portion of a leaf lying between the upper and lower epidermis.
Micropyle, the aperture in the coat of the seed which was the foramen in the ovule.
Moniliform, necklace-shaped ; constricted at intervals.
Monochamlydeous, with only one floral envelope.
Monocotyledonous, having but one cotyledon.
Monœcious, with male and female flowers on the same plants.
Monopetalous. *See* Gamopetalous.
Morphology, the study of the forms of organs.
Mucous, slimy, or covered with a slimy secretion.
Mucronate, abruptly pointed by a sharp spine or mucro.
Muricate, Muriculate, rough, with hard excrescences.
Mycelium, the vegetative filaments of fungi.

N.

Node, that portion of a stem at which a leaf arises.
Nodose, Nodulose, knotted, with swollen joints.
Nucleus, the kernel of an ovule or seed where the embryo is engendered.
Nuculanium, a superior pulpy stony-seeded fruit, *e.g.*, grape.

O.

Obcordate, invertedly cordate.
Obovate, invertedly ovate.
Obtuse, blunt or rounded.
Obvolute, having the margins of one organ alternately overlapping its vis à vis.
Offset, a short lateral shoot or runner, ending in a bud.
Oppositely-pinnate, pinnate with the leaflets arranged in pairs.
Orbicular circular.
Ovary, the lower portion of the pistil containing the ovules.
Ovate, elliptical, broader at the base, shaped like an egg.
Ovule, that part of the flower which, when fertilized, becomes the seed.

P.

Palmate, lobed, with midribs diverging from a common centre.
Palmatifid, palmately divided.
Palmi-nerved, said of the veins of a leaf arranged in a palmate manner.
Panicle, a branched raceme or corymb.
Papilionaceous, with a corolla like a butterfly.
Pappus, the coronate calyx of Composites.
Papyraceous, paper-like in texture.
Parallel-veined, having the veins running parallel along the leaf, or from the midrib to the margin.
Parenchyma, soft cellular tissue, composed of cells united by plane surfaces.
Parietal, born on or growing to walls.
Paripinnate, equally pinnate.
Pedate, where the parts have a palmate arrangement, the lateral portions being once again subdivided.
Peltate, shield-like, attached by centre of surface.
Pendulous, hanging down.
Pepo, a succulent, inferior, one-celled fruit, with seeds borne on three parietal placentæ; a gourd fruit.
Perennial, lasting some years and flowering annually.
Perfoliate, having the petiole apparently traversing the centre of the leaf.
Perianth, the floral envelope consisting of the calyx or corolla or both combined,
Pericarp, the covering shell or rind of fruits.
Perigynous, growing upon the calyx or upon some part which surrounds the ovary.
Persistent, not falling away.
Personate, masked; said of a monopetalous corolla, resembling the mouth of an animal.
Petals, the parts of the corolla.
Petiole, the leaf-stalk.
Phænogamous, having conspicuous or evident flowers.
Phanerogamous. (*See* Phænogamous.)
Pinnæ, the leaflets of a pinnate leaf.
Pinnate divided in a feathery manner.
Pinnatifid, divided halfway to the midrib in segments in a feathery manner.
Pinnatipartite, having the separate lobes of a pinnate leaf almost free.
Pinnatisect, divided nearly to the midrib in a pinnate manner.
Pistil, the female organ of flowering plants, consisting of ovary and stigma (with or without style).
Placenta, the infolded, and in some cases otherwise modified, edge of a carpellary leaf bearing the ovules,
Placentation, the manner in which the placentæ are developed.
Plicate, plaited in folds like a fan; applied to vernation.
Plumule, the rudimentary bud of an embryo.
Pollen, the fertilizing matter of anthers; the ultimate male elements of the plant.
Polyandrous, said of a flower having an indefinite number of stamens.
Polycarpous, with many distinct carpels or fruits to each flower.
Polyembryony, increase in the number of embryos in a seed.
Polypetalous, having the petals free or distinct.
Pome, a many-celled succulent inferior fruit (apple).
Premorse, having an irregular termination as if bitten off.
Primine, the outer integument of an ovule.
Prosenchyma, tissue composed of elongated pointed cells, forming what is termed fibre.
Pubescent, downy.
Putamen, the hard bony stone (endocarp) of certain fruits, as the peach.
Pyxidium, a capsule opening with a lid.

R.

Raceme, an inderterminate or centripetally developed inflorescence.
Racemose, resembling a raceme.
Radicle, the first or elementary root of a plant.
Raphe, the fibro-vascular thread connecting the hilum of an ovule with the chalaza.
Receptacle, a support to one or more similar organs ; a chamber in which secretions are stored.
Regular, having all the parts of the organ symmetrical in shape.
Reniform, kidney-shaped.
Reticulate, having the appearance of network.
Revolute, rolled backwards.
Rhizome, Rootstock, a prostrate or subterranean stem, emitting leaves at the growing-point and rootlets along the under surface.
Rotate, applied to a monopetalous corolla, with a short tube and spreading limb.
Rudimentary, in an incomplete condition.
Runcinate, toothed like a pit-saw, with the teeth inclining backwards.
Runner, a slender prostrate stem, rooting at the nodes.

S.

Saggitate, shaped like an arrow-head.
Samara, a winged, indehiscent fruit.
Sarcocarp, a fleshy mesocarp, the succulent layer of a drupe.
Scabrous, Scabrid, rough.
Scales, rudimentary or metamorphosed leaves.
Scape, a long naked radical penducle rising from the ground.
Scarious, with a thin, dry, shrivelled appearance.
Scutate, buckler-shaped.
Scutiform, shaped like a shield or dish.
Secundine, the inner coat of an ovule.
Sepals, the divisions of the calyx,
Septate, having partitions or divisions.
Septicidal, saidof a fruit dehiscing along the sutures of the carpels, dividing the dissepiments.
Septifragal, said of a fruit splitting by the separating of the backs of the carpels from the septa.
Septum, a partition in an ovary or fruit.
Serrate, toothed in a saw-like manner.
Sessile, without a stalk.
Sheath, a petiole of a leaf wrapped round a stem forming a case.
Silicule, a siliqua about as broad as long.
Siliqua, a long pod with two valves, connected by its edges internally.
Sinuate, with a waved or lobed margin.
Soboles, a creeping underground stem.
Sori, clusters of spore-cases in ferns.
Sorosis, a compound fleshy fruit, resulting from many flowers.
Spadix, a fleshy spike, with many sessile flowers, usually inclosed within a spathe.
Spathe, a large bract sheathing an infloresence.
Spathulate, spoon-shaped.
Spermoderm, *see* testa.
Spike, an inflorescence of sessile flowers on a rachis.
Spores, Sporules, the reproductive bodies of Cryptogams, analagous to seeds.
Squarrose, rough, with projecting appendages.
Stamen, the male organ of flowers, normally consisting of anther and filament.
Stigma, that portion of the style to which the discharged pollen adheres.
Stipules, leaf-like processes developed at the base of the petiole.

Stole, Stolon, a lax trailing and rooting branch.
Stomata, respiratory apertures in the epidermis.
Strobilus, an imbricated scaly inflorescence; a cone.
Style, the prolongation of the ovary bearing the stigma.
Stylopodium, a fleshy disk, bearing the styles in Umbellifers.
Suberous, corky.
Subulate, awl-shaped.
Superior, said of an organ placed above and free of another.
Syconus, a hollow bag-like compound fruit, as of the fig.
Syncarpous, said of a fruit with adherent carpels.

T.

Tap-root, a simple conical root with branches proceeding from it.
Terete, cylindrical.
Ternate, arranged by threes.
Testa, the outer skin of a seed.
Tetradynamous, when, of six stamens, two are longer than the others.
Thalamifloral, Thalamiflorous, having the petals and stamens inserted on the thalamus or receptacle.
Thalamus, the receptacle or disk of a flower.
Thallogens, cellular plants, bearing their fructification on a thallus.
Trachea, a spiral vessel.
Tricoccous, said of a fruit consisting of three elastically dehiscing cocci.
Trifoliate, having three leaflets.
Tripinnate, when the pinnæ of a bipinnate leaf are again pinnate.
Truncate, terminating very abruptly.
Tuber, a swollen succulent internode of an underground stem.
Tubercled, covered with warts.
Tubercule, succulent knob-like expansions of certain roots.

U.

Umbel, an inflorescence in which the pedicels all proceed from the top of the peduncle reaching to about the same height.
Uva, applied to such succulent indehiscent fruits as have a central placenta.

V.

Valvate, united by the edges only.
Venation, the arrangement of veins in a leaf.
Vernation, the arrangement of leaves in the bud.
Verticel, a whorl or circle of bodies around a stem.
Verticellate, in whorls or verticels.
Vesicle, a bladder-like cavity.
Vittæ, narrow oil-containing ducts or canals found in the fruits of Umbellifers.

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ERRATA.

PAGE

25, line 19 from bottom, instead of " CAMMANUM," read " CAMMARUM."
39, at head of page, instead of " SEEDS," read " ROOTS."
43, line 8 from bottom, instead of " similax," read " smilax."
86, line 7 from bottom, instead of " hyoscyanine," read " hyoscyamine."
91, line 13 from top, instead of " Pneumus," read " Peumus."
92, line 25 from bottom, after " Jerba," read (" Yerba.")
96, line 14 from bottom, for " Caryophllus," read " Caryophyllus."
114, line 5 from bottom, for " THYOIDES," read " THUJOIDES."
153, line 22 from bottom, for " Europs," read " Europe."
154, line 8 from top, for " atropurpueus," read " atropurpureus."
199, line 6 from bottom, for " guaiconic acid," read " guaiaconic acid."
247, line 12 from top, for " MARINUS," read " MAXIMUS."
135, line 20 from top, after 7, read " per," line 21 from top, after 3, omit " per."